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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 5, NUMBER 15
AUGUST 1, 1972

W72-08489 -- W72-09138

U.S. DEPARTMENT OF THE INTERIOR
OFFICE OF WATER RESOURCES RESEARCH
WATER RESOURCES SCIENTIFIC INFORMATION CENTER

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 5, NUMBER 15
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Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

FUGACITY OF H20 FROM 0 DEG TO 350 DEG C AT THE LIQUID-VAPOR EQUILIBRIUM AND AT 1 ATMOSPHERE,
Geological Survey, Washington, D.C.
J. L. Hass, Jr.
Geochimica et Cosmochimica Acta, Vol 34, No 8, p. 929-932, 1970, 1 tab, 9 ref.

Descriptors: Ice, *Water, *Water vapor, *Heated water, *Thermodynamics, Mathematical studies, Volatility, Liquids, Equilibrium, Equations, Temperature, Atmospheric pressure, Gases, Water properties, Water chemistry.
Identifiers: *Fugacity of water.

The fugacity and fugacity coefficient of H2O at the liquid-vapor equilibrium, and the fugacity and the Gibbs free energy of formation of H2O at 1 atm (1.01325 bars) total pressure were calculated from published data on the physical and thermodynamic properties of H2O, and are presented at ten-degree intervals from 0 to 350 deg. C. (Woodard-USGS)
W72-08503

02. WATER CYCLE

2A. General

IDENTIFICATION OF URBAN WATERSHED UNITS USING REMOTE MULTISPECTRAL SENSING,
Colorado State Univ., Fort Collins. Dept. of Watershed Science.
For primary bibliographic entry see Field 07B.
W72-08791

STOCHASTICITY IN GEOPHYSICAL AND HYDROLOGICAL TIME SERIES,
Colorado State Univ., Fort Collins.
V. Yevjevich.
Nordic Hydrology, Vol 2, No 4, p 217-242, 1971. 23 fig. NSF Grants GK-11444 and GK-11564.

Descriptors: *Stochastic processes, *Hydrologic cycle, *Solar radiation, *Rainfall, *Runoff, Streamflow, Variability, Probability, Meteorology, Forecasting, Statistical models, Statistics, Time series analysis.

Most processes in the atmosphere, oceans, and the water cycle are periodic-stochastic processes. The physical basis of periodicity is derived from astronomic cycles and the stochasticity is produced by various sources of random behavior in the environment of the earth. The atmosphere is the major source of stochasticity in all those geophysical processes which are connected to incoming solar radiation. The oceans, the earth's surface, and the earth's crust also influence the stochasticity; their main influence is, however, to attenuate the high stochasticity produced by the atmosphere. Without stochastic meteorology a good understanding of many geophysical stochastic processes will be difficult. (Knapp-USGS)
W72-08820

FIELD MEASUREMENTS IN THE DRAINAGE BASIN,
Exeter Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 04A.
W72-08884

GLOBAL EXCHANGE OF ENERGY AND MATERIAL,
State Oceanographic Inst., Moscow (USSR).
V. Stepanov.
Soviet Science Review, Vol. 2, No. 6, p 341-350, November 1971. 5 fig, 12 ref.

Descriptors: *Oceans, *Hydrologic cycle, *Energy budget, *Atmosphere, *Evaporation, Thermal stratification, Thermodynamic behavior, Salt balance, Gases, Sea spray, Latitudinal studies, Heat budget, Water balance, Air temperature, Turbulent flow, Oxygen, Carbon dioxide, Salts, Sulfates, Climatic data, Atmospheric physics.

Of the solar radiation absorbed by the Earth, 80% is consumed in evaporation of water, and 20% in turbulent heat exchange. The varying intensity of absorption and consumption, transport and transformation of energy and material continually produces an excess of heat, water and gases. The oceans play a leading part in these global exchanges. Their high heat capacity and the high degree of stirring to which they are subjected produce a complicated redistribution of the heat and the thick layers of the atmosphere. The global partitioning of heat between the oceans and terrestrial regions and between high and low latitudes is described. The hydrological and thermal cycles are intertwined between water and atmosphere in varying gradients depending upon season and latitude. Each step of each cycle is described and quantitized so that a global budget may be constructed. World gaseous and world salt balances are then considered. Oxygen, carbon dioxide and nitrogen are the important components of the gas balance. Alterations in the ozone layer and the carbon dioxide levels of the ocean and atmosphere due to man's activities are described and it is asserted that much more must be learned about these processes so that we may predict their consequences. (Casey-Arizona)
W72-08901

EVAPOTRANSPIRATION IN THE GREAT PLAINS.
For primary bibliographic entry see Field 02D.
W72-08920

THE SYSTEMATIC APPROACH TO ET MODELING IN THE GREAT PLAINS,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 02D.
W72-08926

EVAPOTRANSPIRATION COMPONENTS OF WATERSHED MODELS FOR THE GREAT PLAINS,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02D.
W72-08930

DERIVATION OF HYDROLOGIC FREQUENCY CURVES,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
G. Leclerc, and J. C. Schaake, Jr.
Available from the National Technical Information Service as PB-209 761, $3.00 in paper copy, $0.95 in microfiche. Ralph M. Parsons Laboratory Report No. 142, January 1972, 151 p, 27 fig, 6 tab, 30 ref, 4 append. OWRR C-2137- (No. 3403) (2).

Descriptors: *Rainfall-runoff relationships, *Urbanization, *Simulated rainfall, *Flood frequency, Mathematical models, Control systems, Monte Carlo method.

A new approach for deriving runoff-related frequency curves is analyzed. The approach consists of deriving the frequency curves directly from the rainfall process. In this work the reliability and computational efficiency of the approach is assessed through the derivation of the flood frequency curves of a small hypothetical catchment. The procedure followed consisted of simulating a continuous series of rainfall events, selecting and routing the storms likely to produce large peak flows; then a series of peakflows, obtained from the derived hydrographs, is built and the flood frequency curve constructed. A comparison is included of the frequency curves derived by (i) an analytical model and by (ii) the simulation model developed in this effort. The comparison is not excellent but the differences between the two curves are explained. The derivation of frequency curves only by the stochastic simulation method of solution can be expensive if a good resolution is required at large recurrence interval. It was suggested to develop hybrid methods of solution which would limit the need for simulation. Further work is needed to compare derived frequency curves with observed frequency curves.
W72-08951

POLE-TO-POLE WATER BALANCE FOR THE IGY FROM AEROLOGICAL DATA,
Massachusetts Inst. of Tech., Cambridge.
J. P. Peixoto.
Nordic Hydrology, Vol 3, No 1, p 22-43, 1972. 9 fig, 2 tab, 18 ref. NSF Grant GA-1310X.

Descriptors: *Hydrologic cycle, *Water balance, *Climatology, Synoptic analysis, Water circulation, Meteorology, Evaporation, Hydrologic budget, Atmosphere, Air circulation, Water vapor.

The water balance is discussed on a planetary scale, covering the mean and the seasonal conditionns for the calendar year 1958. The study includes analyses of the amount of precipitable water, of the vertically integrated transport vector field, and of the divergence of water vapor flux for the entire earth. The water balance values based upon the various water vapor fields are compared. The inferred values obtained from the analysis of the water vapor divergence field are compared with estimates of evaporation and precipitation obtained from independent climatological sources. (Knapp-USGS)
W72-09004

CHECKS ON THE WATER BALANCE OF A SMALL CATCHMENT,
Hull Univ. (England).
R. C. Ward.
Nordic Hydrology, Vol 3, No 1, p 44-63, 1972. 5 fig, 6 tab, 7 ref.

Descriptors: *Water balance, *Small watersheds, *Rainfall-runoff relationships, Evapotranspiration, Rainfall, Runoff, Infiltration, Soil moisture, Water storage, Data processing, Data collections, Hydrographs.

Water balance data from a small (16 sq km) boulder clay catchment were analyzed. To check the accuracy of the calculations, water balances were cast for different, overlapping periods of time within the same run of data (three-year, annual, seasonal, monthly, ten-day and storm-period). For each period the residual values are satisfactorily low (12 mm for the three-year balance and zero for the storm-period balance). A further series of checks was provided by rewriting the water equation in a number of different ways to enable estimated and measured values of water balance components to be compared. The measured values seem to be accurate and the catchment appears to be watertight. (Knapp-USGS)
W72-09005

MODELLING TECHNIQUES IN WATER RESOURCES SYSTEMS.
For primary bibliographic entry see Field 06A.
W72-09065

ECONOMICS OF HYDROLOGIC MODELLING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 06A.
W72-09072

2B. Precipitation

LEGAI ASPECTS OF THE UTILIZATION OF ARTIFICIAL SATELLITES FOR METEOROLOGICAL AND RADIO COMMUNICATION PURPOSES,
Akademiya Nauk SSSR, Moscow. Inst. of State and Law.
For primary bibliographic entry see Field 06E.
W72-08489

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR LITTLE POND CREEK AND NORTH ELM CREEK, BRAZOS RIVER BASIN, TEXAS, 1970,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02E.
W72-08524

USE OF THE GAMMA DISTRIBUTION IN SINGLE-CLOUD RAINFALL ANALYSIS,
Atlantic Oceanographic and Meteorological Labs., Miami, Fla.
J. Simpson.
Monthly Weather Review, Vol 100, No 4, p 309-312, April 1972. 3 fig, 3 tab, 12 ref.

Descriptors: *Cloud seeding, *Statistical methods, *Probability, *Rainfall, Weather modification, Florida, Correlation analysis.
Identifiers: *Bayesian analysis, *Gamma distribution.

In a study of rainfall data from 52 south Florida cumulus clouds, 26 seeded and 26 control clouds, the fourth root of the rainfall for both seeded and control populations was well fitted by a gamma distribution for probability density. The gamma distribution is prescribed by two parameters, one for scale and one for shape. Since the coefficient of variation of seeded and control cloud populations was the same, the shape parameters for the two gamma distributions were the same, while the seeded population's scale parameter was such as to shift the distribution to higher rainfall values than the control distribution. The best-fit gamma functions were found by application of the principle of maximum entropy. Specification of tractable distributions for natural and modified rainfall populations provides an important prerequisite for the evaluation of seeding effects by Bayesian statistics, a continuing objective in the Experimental Meteorology Laboratory (NOAA) seeding programs. (Knapp-USGS)
W72-08719

SURGES OF MARITIME TROPICAL AIR NORTHWARD OVER THE GULF OF CALIFORNIA,
National Weather Service Forecast Office, Phoenix, Ariz.
J. E. Hales, Jr.
Monthly Weather Review, Vol 100, No 4, p 298-306, April 1972. 15 fig, 6 tab, 5 ref.

Descriptors: *Weather patterns, *Arizona, *California, *Sea breezes, *Synoptic analysis, Air masses, Precipitation (Atmospheric), Rainfall, Pacific Ocean, Air circulation, Winds, Marine air masses.
Identifiers: *Gulf of California.

Surges of maritime tropical air into the deserts of Arizona and California are related to the large cloud masses of tropical origin located over the Gulf of California. A natural channel exists for this surge transport; it is about 200 mi in width, the western boundary being the rugged ridge line extending the length of Baja California and the eastern boundary being the broad Sierra Madre Range. The surge process resembles that of a very large-scale sea breeze with the greatest energy transport occurring near the surface and disappearing in the middle troposphere. The channeling of a tropical air mass into Arizona can result in very significant rainfall and frequently causes a sharp change of air mass. The concept of the gulf surge may also help to explain the hard-to-accept statement made quite often that circulation around a tropical disturbance several hundred miles out in the Pacific results in an increase of tropical moisture over Southern California and Arizona. (Knapp-USGS)
W72-08728

MINIMAL TROPICAL DEPRESSION PRODUCES RECORD RAINS AND UNPRECEDENTED FLOODS,
National Weather Service, Quincy, Fla.
D. R. Davis, and W. C. Bridges.
Monthly Weather Review, Vol 100, No 4, p 294-297, April 1972. 4 fig, 1 tab, 6 ref.

Descriptors: *Hurricanes, *Florida, *Floods, *Precipitation (Atmospheric), *Rainfall, Precipitation intensity, Rainfall-runoff relationships, Tropical cyclones, Georgia, Synoptic analysis, Peak discharge.

A weak tropical depression moved out of the Gulf of Mexico on September 19-20, 1969. With the blocking action of a surface high and in the absence of steering currents aloft, the low became stationary on the Florida coast for approximately 48 hr. Torrential rains occurred in a small area 60-65 mi to the east and 50 mi inland from the point where the low made landfall. Record-breaking floods resulted. The 23-inch maximum point rainfall was about 9 inches greater than the previous maximum rainfall of record produced by a 1924 tropical storm in the same area. The location of the area of maximum rainfall with respect to the point of landfall of the low's center closely follows the pattern previously reported for the more intense hurricanes and tropical storms. (Knapp-USGS)
W72-08729

PERFORMANCE ANALYSIS OF THE HURRAN TROPICAL CYCLONE FORECAST SYSTEM,
National Weather Service, Miami, Fla.
C. J. Neumann, and J. R. Hope.
Monthly Weather Review, Vol 100, No 4, p 245-255, April 1972. 12 fig, 2 tab, 14 ref.

Descriptors: *Weather forecasting, *Hurricanes, *Warning systems, *Analog models, Data processing, Data collections, Meteorology, Weather patterns.
Identifiers: *Hurrican forecasting.

The HURRAN (hurricane analog) technique, a fully computerized objective forecast aid making use of past tracks in forecasting hurricane motion, was developed prior to the 1969 hurricane season. Encouraging operational results during the 1969 and 1970 hurricane seasons suggested further evaluation of the technique. To this end, HURRAN computations were made for approximately 1,000 forecast situations. Results are stratified according to initial direction and speed of movement of the sample storms and the number of analogs selected. The utility of the technique is discussed, and the importance of position accuracy at forecast time is demonstrated. (Knapp-USGS)
W72-08730

RADIOCARBON DATING OF EAST AFRICAN LAKE LEVELS,
Chicago Univ., Ill.
For primary bibliographic entry see Field 02H.
W72-08731

STOCHASTICITY IN GEOPHYSICAL AND HYDROLOGICAL TIME SERIES,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 02A.
W72-08820

CLIMATE-ENGINEERING SCHEMES TO MEET A CLIMATIC EMERGENCY,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 03B.
W72-08900

GLOBAL EXCHANGE OF ENERGY AND MATERIAL,
State Oceanographic Inst., Moscow (USSR).
For primary bibliographic entry see Field 02A.
W72-08901

GLOBAL CLIMATE CHANGE AND THE IMPACT OF A MAXIMUM SEA LEVEL ON COASTAL SETTLEMENT,
North Carolina Univ., Chapel Hill. Dept. of Geography.
For primary bibliographic entry see Field 06G.
W72-08902

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES.
Agricultural Research Service, Washington, D.C. Soil and Water Research Div.

Report ARS 41-176, D. M. Hershfield, compiler, June 1971. 117 p.

Descriptors: *Demonstration watersheds, *Precipitation (Atmospheric), *Distribution patterns, *Precipitation gages, *Data collections, Snow, Instrumentation, Networks, Seasonal, Rain, Rainfall-runoff relationships, Runoff forecasting, Rainfall, Meteorology, Climatology.

These descriptions of current precipitation studies by the Soil and Water Conservation Research Division, Agricultural Research Service, were assembled both to provide an awareness of the location and scope of such studies and as a reference to some of the findings to date. The studies are primarily aimed at providing information about precipitation pertinent to research on the hydrology of specific agricultural watersheds rather than for investigations of precipitation patterns for their own sake. Some of the gages in the observational program have been placed on an equally spaced grid or otherwise stratified so that information about the temporal and spatial variations of precipitation on the areas sampled are provided within practical limits. Although obtained primarily from rural areas, the findings from the networks can also be taken as indicative of precipitation in urban settings. Prediction in watershed hydrology not only involves the problem of devising suitable physical models, but also increases the demand for observations and analyses. Newer methods involve evaluation of quantities that depend upon the detailed precipitation field. Researchers in the field of watershed hydrology realize that development of this discipline will require the improvement of both observation and prediction methods. (See W72-08904 thru W72-08919) (Knapp-USGS)
W72-08903

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: WALNUT GULCH, ARIZ.,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
D. L. Chery, and H. B. Osborn.
In: Report ARS 41-176, p 1-13, June 1971. 1 fig, 2 tab, 21 ref.

Descriptors: *Precipitation gages, *Networks, *Arizona, *Data collections, *Data processing, Meteorological data, Runoff forecasting, Rainfall, Snow, Precipitation (Atmospheric), Demonstration watersheds.
Identifiers: *Walnut Gulch Experimental Watershed (Ariz).

The rain-gage network of the Walnut Gulch watershed, Arizona, is part of a comprehensive research program to determine the future water yield potential of semiarid rangeland watersheds in the Southwest as related to measures for their conservation and sustained production of forage, determine optimum utilization of water yield for local and downstream uses, and obtain information needed for planning measures for flash flood and sediment control. Rainfall is sampled by a weighing rain gage with an orifice 8 inches in diameter. Each rain gage produces an analog recording of accumulated rainfall versus time. The rain-gage records are digitized with an analog-to-digital converter coupled with a card punch. The data in punchcard format are then loaded on magnetic tape and processed by a checking program that checks for more than 50 logical or possible error situations. A list of the data, with the errors noted, is printed, from which corrections are prepared. Corrections to the tape are keypunched, and the data tape is corrected by an updating program. After the corrections have been made and confirmed, the data are processed by a tabulation program, which provides a printed output and one tape output. The average annual rainfall over the entire 58-square-mile watershed has ranged from 7.1 to 14.2 inches with a mean of 11.3 inches for 1955-56. The year's precipitation falls during two distinct periods with greatly differing characteristics. Winter precipitation, amounting to one-third of the annual total, occurs as snow or rain of wide areal extent and low intensity. Runoff has never been recorded from winter storms except on very small areas. Most of the remaining two-thirds of the precipitation falls during July, August, and September as a result of intense convective thunderstorms of limited areal extent. Practically all runoff results from this type of storm. Of the runoff-producing portions of these summer storms, 80% have been observed to cover 4.5 sq mi or less within the confines of the Walnut Gulch watershed; however, this includes many storms falling on the edge of the area, with portions of their extent not measured. (See also W72-08903) (Knapp-USGS)
W72-08904

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: VERO BEACH, FLA.,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
W. C. Mills.
In: Report ARS 41-176, p 15-20, June 1971. 3 fig, 1 tab, 6 ref.

Descriptors: *Precipitation gages, *Networks, *Florida, *Data collections, *Data processing, Meteorological data, Runoff forecasting, Rainfall-runoff relationships, Rainfall, Precipitation (Atmospheric), Demonstration watersheds.
Identifiers: *Vero Beach experimental watersheds (Fla).

Precipitation studies are conducted on three experimental watersheds in the vicinity of Vero Beach, Fla., as an integral part of a study to evaluate their overall hydrology. Such an evaluation provides hydrologic information for the development, control, and efficient use of water resources throughout central and southern Florida, which is rapidly developing its agriculture. Precipitation occurs almost exclusively as rainfall. Mean annual rainfall is 53 inches for the two watersheds near the Atlantic Coast and 48 inches for the inland watershed. The greater portion of annual rainfall normally occurs during June through October (62% for the coastal areas and 65% for the inland watershed). Most extreme rainfall events occur during this period, and many of them are associated with hurricanes. November through February is usually dry; only 14% to 18% of the total annual rain falls during this period. During March through May, rainfall amounts are somewhat between those for the wet and dry periods. Curves expressing rainfall depth-area relations for the watersheds indicate greater areal rainfall variability for short-duration storms than for long-duration storms. (See also W72-08903) (Knapp-USGS)
W72-08905

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: TIFTON, GA.,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
W. C. Mills.
In: Report ARS 41-176, p 21-24, June 1971. 1 fig, 1 tab.

Descriptors: *Precipitation gages, *Networks, *Georgia, *Data collections, Data processing, Meteorological data, Urbanization, Runoff forecasting, Rainfall-runoff relationships, Rainfall, Precipitation (Atmospheric), Demonstration watersheds.
Identifiers: *Little River Experimental Watershed (Ga).

Little River experimental watershed near Tifton, Ga., was selected in 1966 for intensive hydrologic investigations. It is located in the Southern Coastal Plain and is considered to be generally representative of upstream agricultural watersheds in a large portion of this land resource area. Demands upon water resources of this region are becoming greater as both agricultural and industrial uses expand. Information to be gained from the Little River hydrologic studies is needed for planning, development, and efficient use of upstream water resources throughout the Coastal Plain. In addition, hydrologic measurements are made on a small adjacent watershed, which is becoming urbanized, to provide for evaluation of urbanization effects on the quantity and quality of streamflow. Precipitation on the Tifton watersheds and surrounding area is monitored by a network of 55 digital-type rain gages covering a 250-square-mile area. Precipitation in the Tifton, Ga., area occurs almost exclusively as rainfall. Average annual rainfall for a 47-year record at the Coastal Plains Experiment Station at Tifton is 47.10 inches. According to long-term monthly averages at this station, there is a very pronounced maximum and minimum in the seasonal rainfall distribution. Maximum rain occurs in midsummer and minimum in autumn. The average rainfall for July is more than three times that of either October or November. A second maximum in the annual rainfall curve occurs in March and a second minimum in May; however, these are not nearly as pronounced as the summer and autumn extremes. Individual summer rains are usually associated with thunderstorm activity, and the areal distribution is highly variable. For 15 major summer rains occurring in 1967 and 1968, average rainfall over the Tifton network ranged from 16% to 50% of maximum recorded point rainfall. (See also W72-08903) (Knapp-USGS)
W72-08906

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: REYNOLDS CREEK, IDAHO,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
W. R. Hamon.
In: Report ARS 41-176, p 25-35, June 1971. 9 fig, 3 tab.

Descriptors: *Precipitation gages, *Networks, *Idaho, *Data collections, Data processing, Snow, Rainfall, Meteorological data, Runoff forecasting, Precipitation (Atmospheric), Demonstration watersheds, Calibrations.
Identifiers: *Reynolds Creek Experimental Watershed (Idaho).

A dense precipitation gage network is an integral part of the hydrologic studies in the Reynolds Creek Experimental Watershed located in southwestern Idaho. Overall, the study is to gain a better understanding of the role of the land and the influences of vegetation, climate, and land management on the movement of water and sediment. Accurate point measurements of precipitation at sufficient sites to determine the temporal and spatial variations in precipitation are needed to develop a predictive hydrologic model. The Reynolds Creek Experimental Watershed, a rugged 90-square-mile area in the Owyhee Mountains, forms the headwaters of a north-flowing tributary of the Snake River. The lowest elevation is about 3,600 feet. The eastern watershed boundary rises to about 5,000 feet; the western, to 6,000 feet; and the southern, to a peak of 7,200 feet. Isolated peaks a few miles south and west reach elevations of 8,000 feet. Prevailing winds and most precipitation are from the southwest. Convective storms during the summer move in a less systematic fashion. The present network of precipitation gages consists of dual-gage installations with one shielded and one unshielded recording gage at each site. The original unshielded recording gage network installed in 1960-61 was replaced by the dual-gage network in 1967-68. (See also W72-08903) (Knapp-USGS)
W72-08907

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: TREYNOR, IOWA,
Agricultural Research Service, Council Bluffs, Mo.
R. G. Spomer, and K. E. Saxton.
In: Report ARS 41-176, p 37-42, June 1971. 4 fig, 1 tab.

Descriptors: *Rain gages, *Soil erosion, *Gully erosion, *Iowa, *Demonstration watersheds, *Land use, Networks, Erosion, Erosion control, Hydrogeology, Infiltration, Rainfall-runoff relationships, Streamflow forecasting, Groundwater, Sedimentation, Data collections.
Identifiers: Treynor Experimental Watershed (Iowa).

A rain gage network is located on five experimental watersheds in the deep loess soils area in Treynor, western Iowa, where gully erosion is a severe problem. Each watershed contains an active gully that is studied to determine its rate of growth and the volume of soils voided. The processes that cause gully growth, such as surface runoff, groundwater seepage, and physical soil behavior, are identified and their relative importance evaluated. The effect of land use above these gullies is evaluated by maintaining two watersheds (75 and 83 acres) in contour corn, one (107 acres) in grass cover, one (150 acres) in level-terraced corn, and one (389 acres) in level-terraced mixed crops. Other objectives include hydrologic studies of surface and subsurface flows. Hydrologic boundaries are well defined for both the surface water and groundwater, and all variables within the hydrologic budget are being measured. Soil erosion from the watershed surfaces is calculated from suspended sediment samples of the surface runoff. These erosion rates, which do not include gully erosion, are correlated with the land use. Soil and water pollution by commercial fertilizer is studied by applying two rates of nitrogen and phosphorus on the watersheds. Nutrient levels of the crops, soil, groundwater, sediment, and streamflow are measured. (See also W72-08903) (Knapp-USGS)
W72-08908

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: OXFORD, MISS.,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
A. J. Bowie.
In: Report ARS 41-176, p 43-50, June 1971. 3 fig, 5 tab.

Descriptors: *Rain gages, *Demonstration watersheds, *Mississippi, *Erosion, *Sediment yield, Networks, Rainfall-runoff relationships,

Rainfall, Precipitation (Atmospheric), Urban hydrology, Urban runoff, Sedimentation, Groundwater, Infiltration, Data collections.
Identifiers: *Oxford (Miss), *Pigeon Roost Creek watershed (Miss).

A sedimentation research project in the Pigeon Roost Creek Watershed, Marshall County, Miss., was initiated in September 1956. Studies on Toby Tubby Creek Watershed at Oxford, Miss., began during the latter part of 1959. The gaging site for this 1,000-acre urban watershed is located adjacent to the Sedimentation Laboratory. In the instrumentations of the watersheds for runoff and sediment-yield investigations, the rain-gage network was designed to describe precipitation events. The objectives are to furnish precipitation data useful in studies of runoff, sediment yields, groundwater recharge, and the potential of rainfall to cause erosion. Precipitation data have been collected for 13 years on the Pigeon Roost Creek Watershed and 9 years on the Toby Tubby Creek Watershed. The IBM 360 computer is used to compute the desired output. A long-term (48 years) precipitation record, collected at a nearby ESSA station, is available for comparison with the Pigeon Roost Creek precipitation data. Precipitation for several storms was computed by the isohyetal and Thiessen methods. In a comparison of the two methods, discrepancy was induced by the Thiessen method for heavy convective storms centered along the watershed boundary. For most storms, however, the Thiessen method is considered to be fairly accurate and is used to compute the precipitation for each of the subwatersheds in the study area. (See also W72-08903) (Knapp-USGS).
W72-08909

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: EKALAKA, MONT.
Agricultural Research Service, Sidney, Mont. Northern Plains Soil and Water Research Center.
E. L. Neff.
In: Report ARS 41-176, p 51-55, June 1971. 3 fig, 3 tab.

Descriptors: *Rain gages, *Montana, *Demonstration watersheds, *Land use, Hydrologic data, Meteorological data, Data collections, Erosion, Rainfall-runoff relationships, Water balance, Networks, Instrumentation.
Identifiers: *Ekalaka (Mont).

To study the effects of selected range management practices on the hydrology and vegetation of panspot and saline upland range sites in southeastern Montana, a dense network of rain gages provides quantitative measurements of precipitation. The research site is located approximately 15 miles south of Ekalaka, Carter County, Mont. Two-acre watersheds are constructed on three representative research sites, each characteristic of one main soil-vegetation complex found in saline upland and panspot ranges. Also, at each site recording pit gages are installed with the orifices at ground level to measure the differences in catch due to wind influence. At Ekalaka, 15 miles north of the research area, annual precipitation has ranged from about 6 inches in 1936 to over 22 inches in 1963, with the average annual amount being about 14 inches. Almost 80% of the annual precipitation results from convective storm activity during the warm season, April through September, with the months of May and June averaging about 2.5 inches each. This network is designed to provide quantitative measurements of precipitation input to small areas for intensive hydrologic investigations. When the network has been operated long enough to provide a good measure of precipitation variability within sites, it will be reduced to only those gages necessary to measure input within acceptable limits. (See also W72-08903) (Knapp-USGS)
W72-08910

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: ALAMOGORDO CREEK, N. MEX.,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
D. L. Chery, and H. B. Osborn.
In: Report ARS 41-176, p 57-63, June 1971. 1 fig, 1 tab, 7 ref.

Descriptors: *Rain gages, *Demonstration watersheds, *New Mexico, *Data collections, Meteorological data, Hydrologic data, Sediment yield, Sedimentation, Rainfall, Precipitation (Atmospheric), Arid lands, Instrumentation.
Identifiers: Alamogordo Creek Experimental Watershed (N Mex).

The rain-gage network of the Alamogordo Creek Experimental Watershed, New Mexico is part of a comprehensive research program to (1) determine the future water yield potential of semiarid rangeland watersheds in the Southwest as related to measures for their conservation and sustained production of forage, (2) determine optimum utilization of water yield for local and downstream uses, and (3) obtain information needed for planning and designing measures for flash flood and sediment damage control. The specific objectives of the precipitation study are to develop methods for evaluating rainfall amounts and rates for semiarid rangelands in the Southwest; to determine seasonal distribution of precipitation; to determine frequency, amount, and areal extent of storms; and to determine pertinent characteristics of rainfall with respect to runoff and sediment movement. (See also W72-08903) (Knapp-USGS)
W72-08911

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: COSHOCTON, OHIO,
North Appalachian Experimental Watershed, Coshocton, Ohio.
J. L. McGuinness.
In: Report ARS 41-176, p 65-69, June 1971. 1 fig, 3 tab, 19 ref.

Descriptors: *Rain gages, *Networks, *Ohio, *Appalachian Mountain Region, *Meteorological data, Data collections, Water yield, Demonstration watersheds, Rainfall-runoff relationships, Runoff forecasting, Hydrologic data, Instrumentation.
Identifiers: *Coshocton (Ohio), *North Appalachian Experimental Watershed (Ohio).

A network of recording rain gages was established at the North Appalachian Experimental Watershed near Coshocton, Ohio, in the late 1930's and has been maintained with few changes to the present. Topography of the area varies from rolling to hilly. This site was chosen because it typifies much of the agricultural land in the unglaciated Allegheny Plateau, an area covering parts of southeastern Ohio, western Pennsylvania, western West Virginia, and a portion of eastern Kentucky. The rain-gage network was established to measure the temporal and areal variations in precipitation for 40 gaged experimental watersheds ranging from 0.6 to 17,500 acres. In addition, the network furnishes information which is useful in supplementing published generalized weather information. The close spacing of the research gages permits studies on a meso scale instead of the more prevalent macro scale studies. Annual precipitation over the North Appalachian Experimental Watershed averages just over 37 inches. Winter precipitation, mainly due to cyclonic storms, is generally of low intensity but long duration and covers large areas. The average winter produces about 26 inches of snow. After melting, this is about 16% of the normal 16.81 inches of November to April precipitation. The ground is usually bare of snow but snowmelt does make an occasional contribution to runoff. Summer precipitation is characterized by convectional rains of high intensity but short duration. These storms are erratic in their areal distribution, but they tend to cover smaller areas than the winter storms. (See also W72-08903) (Knapp-USGS)
W72-08912

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: CHICKASHA, OKLA.,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
A. D. Nicks.
In: Report ARS 41-176, p 71-81, June 1971. 5 fig, 2 tab, 8 ref.

Descriptors: *Rain gages, *Networks, *Data collections, *Oklahoma, *Rainfall-runoff relationships, Water yield, Instrumentation, Hydrologic data, Meteorological data, Depth-area-duration analysis, Runoff forecasting, Demonstration watersheds.
Identifiers: *Washita River Watershed (Okla), Chickasha (Okla).

In 1960 comprehensive research was initiated on the Washita River watershed in Oklahoma to determine the changes that may take place in the flood flows, water and sediment yields, and channel characteristics of the main stem of the river as a result of the installation of upstream conservation works. An important goal was a reliable assessment of the precipitation input to the area. To provide for this assessment, a rain-gage network was designed and installed on the study reach. Other specific objectives are (1) to develop basic information on amounts, duration, areal and seasonal distribution, storm paths, and other characteristics of precipitation affected by geographic location, topography, and other factors; (2) to determine and evaluate precipitation parameters useful in estimating runoff; and (3) to relate point precipitation measurements to mean precipitation on various-size watersheds. The rain-gage network consists of a uniform network of recording gages spaced on a 3-by-3-mile grid. The basic network includes 168 gages. The network area is in a region of moist to dry subhumid climate. Normal annual precipitation according to U.S. Weather Bureau data varies from 33 inches on the east to 28 inches on the west edge of the network. The normal for Chickasha, near the center of the area, is 31.60 inches. About 98% of the yearly precipitation occurs as rainfall. (See also W72-08903) (Knapp-USGS)
W72-08913

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: KLINGERSTOWN, PA.,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
J. C. Carr.
In: Report ARS 41-176, p 83-87, June 1971. 4 fig, 1 tab.

Descriptors: *Precipitation gages, *Pennsylvania, *Networks, *Data collections, Climatology, Hydrologic data, Meteorological data, Water yield, Demonstration watersheds.
Identifiers: Mahantango Experimental Watershed (Penn).

The Northeast Watershed Research Center was established in 1966. The purpose is to study the interaction of land and water resources in an agricultural environment with major research areas in engineering hydrology and water quality. The principal unit of research is the agricultural watershed, in which outputs can be balanced against inputs. The 162-square-mile Mahantango watershed, Pennsylvania, was instrumented with a network of 43 rain gages and seven stream-gaging stations. Other data for selective research projects are pan evaporation, wind movement, temperature and humidity, soil moisture, radiation, snow depth, and groundwater levels. (See also W72-08903) (Knapp-USGS)
W72-08914

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: COTTONWOOD, S. DAK.,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
C. L. Hanson.
In: Report ARS 41-176, p 89-92, June 1971. 2 fig, 3 tab, 2 ref.

Descriptors: *Precipitation gages, *Networks, *South Dakota, *Grasslands, Instrumentation, Data collections, Hydrologic data, Meteorological data, Land use, Pastures, Water balance, Rainfall-runoff relationships, Demonstration watersheds.
Identifiers: *Cottonwood (S. Dak).

The Cottonwood Range Field Station is approximately 75 miles east of Rapid City and is a part of the South Dakota Agricultural Experiment Station. Watershed study areas were established in each of three differentially grazed pastures in 1962. Confining dikes were constructed on four 2-acre contiguous watersheds on each of the three pastures. The soils are slowly permeable, heavy clays derived from the Pierre Formation with slopes averaging 7.8%. Each set of watersheds has a northeast aspect. The lightly and heavily grazed watersheds lie about one-quarter mile on either side of the moderate watersheds. Two-foot H-flumes and FW-1 waterstage recorders measure runoff. Four 8-inch recording rain gages measure the precipitation on each set of watersheds. The mean annual precipitation at the experiment station headquarters is 15.22 inches and has ranged from 7.13 inches in 1936 to 27.62 inches in 1915. During the growing season, thunderstorms are associated with most of the precipitation, and therefore there is a wide range of amounts and intensities of rain. June is the month of highest precipitation with an average of 2.99 inches. The driest month is December when the average precipitation is 0.35 inch. (See also W72-08903) (Knapp-USGS)
W72-08915

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: NEWELL, S. DAK.,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
E. L. Hanson.
In: Report ARS 41-176, p 93-96, June 1971. 1 fig, 3 tab, 4 ref.

Descriptors: *Rain gages, *Networks, *South Dakota, *Water yield, *Sediment yield, Instrumentation, Data collections, Hydrologic data, Meteorological data, Land use, Pastures, Grasslands, Demonstration watersheds.
Identifiers: *Newell (S. Dak).

A network of 17 recording rain gages are distributed over a 1,000-square-mile area of western South Dakota. The rain-gage network is used primarily to measure precipitation for developing methods for estimating water and sediment yields from rangeland watersheds. To accomplish these objectives, 32 watersheds on moderately coarse-textured soils and 26 on fine-textured soils were selected and instrumented in 1962. The mean annual precipitation at the Newell Experiment Station is 15.47 inches and has ranged from 6.64 inches in 1911 to 28.04 inches in 1946. During the growing season, thunderstorms are associated with most of the precipitation, and, therefore, there is a wide range of amounts and intensities of rain. June is the month of highest precipitation with an average of 3.07 inches. Driest months are December through February, which receive about 0.4 inch of precipitation each. (See also W72-08903) (Knapp-USGS)
W72-08916

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: RIESEL, TEX.,
Agricultural Research Service, Riesel, Tex. Blacklands Experimental Watershed.
W. G. Knisel, Jr., and R. W. Baird.
In: Report ARS 41-176, p 97-102, June 1971. 4 fig, 3 tab.

Descriptors: *Rain gages, *Networks, *Texas, *Sedimentation, *Water balance, Depth-area-duration analysis, Storm runoff, Meteorological data, Hydrologic data, Data collections, Instrumentation, Demonstration watersheds.
Identifiers: *Blacklands Experimental Watershed (Tex).

Precipitation data have been collected in the Blacklands Experimental Watershed near Riesel, Tex., since 1937. Rain-gage networks of various densities have been maintained on the 9.6-square-mile area for 32 years. The primary objective of the rain-gage network is to furnish basic data for runoff, groundwater, and sedimentation studies in the watershed. Other objectives are to determine (1) rainfall variability over small areas, (2) rainfall depth-area relationships, (3) storm sequence rainfall, and (4) rainfall depth-frequency relationships. Average annual precipitation was 33.63 inches for 1937-68. Most of the precipitation was associated with Canadian continental and Pacific maritime frontal movements. The largest monthly amounts normally occur in April, May, and June. (See also W72-08903) (Knapp-USGS)
W72-08917

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: SONORA (SUTTON COUNTY), TEX.,
Agricultural Research Service, Riesel, Tex. Blacklands Experimental Watershed.
W. G. Knisel, Jr.
In: Report ARS 41-176, p 103-107, June 1971. 3 fig, 2 tab.

Descriptors: *Raingages, *Networks, *Texas, *Data collections, Rainfall-runoff relationships, Water yield, Sediment yield, Depth-area-duration analysis, Storm runoff, Hydrologic data, Metoerological data, Demonstration watersheds.
Identifiers: *Sonora (Tex), *Lowrey Draw watershed (Tex).

Precipitation data have been collected in the Lowrey Draw Watershed near Sonora (Sutton County), Tex., since June 1961. Lowrey Draw Watershed lies within the Edwards Plateau physiographic area. The plateau proper is a smooth upland surface with little relief and is dissected by relatively deep, narrow valleys arranged in a dendritic pattern. Approximately 40% of the area is upland and 60% has moderate to steep slopes on the valley sides. Elevation of the watershed ranges from 2,125 to 2,400 feet above mean sea level. The primary objective of the rain-gage network in the Lowrey Draw Watershed is to furnish basic data for runoff, groundwater, and sedimentation studies in the basin. Other objectives are to determine (1) rainfall variability over small areas, (2) rainfall depth-area relationships, and (3) storm sequence rainfall. Average annual precipitation at Sonora was 22.19 inches for 1962-68 inclusive. Precipitation for the months of April, May, and September resulted largely from Canadian continental and Pacific maritime frontal movements. Convective thunderstorms characterized by high intensity and short duration accounted for significant rainfall amounts in June, July, and August. Little rainfall occurred during the winter (November through March). (See also W72-08903) (Knapp-USGS)
W72-08918

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: DANVILLE, VERMONT,
Agricultural Research Service, Danville, Vt. Soil and Water Conservation Research Div.
R. L. Hendrick.
In: Report ARS 41-176, p 109-117, June 1971. 3 fig, 3 tab, 9 ref.

Descriptors: *Precipitation gages, *Vermont, *Snow surveys, *Water balance, Water yield, Rainfall-runoff relationships, Topography, Hydrologic data, Meteorological data, Data collections, Demonstration watersheds, Instrumentation.
Identifiers: *Sleepers River Experimental Watershed (Vt).

In 1957, the Agricultural Research Service selected the 43-square-mile Sleepers River basin in northeastern Vermont for the establishement of a research watershed. The research is designed to develop understanding and to improve prediction of the hydrologic and water-related environmental processes in the water source regions of New England. The Sleepers River watershed is a drainage area typical of the formerly glaciated rural New England highlands in terms of topography, land use, vegetation patterns, geology, and climate. As a small source area for the upper Connecticut River, the Sleepers River is a part of the largest, most developed, and increasingly the most critical river water system in New England, thereby providing direct resource and conservation applications for research studies. The watershed is characteristic of cold climate, upland, rural New England with small dairy farms, small villages, and forested hills. Elevations range from 660 to 2,590 feet, with a general slope and drainage from west-northwest toward east-southeast. The spatial variation of annual precipitation from 30 to 45 inches in clearly related to elevation; this effect of greater precipitation at higher elevations is most pronounced in winter. More than one-half of the annual runoff usually occurs during April and May. (See also W72-08903) (Knapp-USGS)
W72-08919

ESSA: A DISSEMINATOR AND USER OF ET DATA,
Environmental Data Service, Silver Spring, Md. Lab. for Environmental Data Search.
For primary bibliographic entry see Field 02D.
W72-08921

THE RELATIVE EFFICIENCY OF THE DENSITY OF RAIN-GAGE NETWORKS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
P. T. Stol.
Journal of Hydrology, Vol 15, No 3, p 193-208, March 1972. 8 fig, 5 tab, 14 ref.

Descriptors: *Rain gages, *Instrumentation, *Calibrations, *Network design, Networks, Statistics, Data collections, Hydrologic data, Water balance, Rainfall, Precipitation (Atmospheric).
Identifiers: *Netherlands.

A dense network of rainfall stations gives highly correlated results in neighboring stations. To avoid the establishment of a too dense network, evaluation of the properties of a network in a given area has to be carried out. For this reason the interstation correlation-distance relationship was analyzed for a network of rainfall stations in the eastern part of the Netherlands. Two models are used to fit the plot of each month. Both models are of the negative exponential type, the first one with a linear relation between distances, the second one with a quadratic relation between distances. Extrapolation of each model to zero distance does not result in a correlation coefficient equal to 1. Discrepancies from this value are considered to represent all exposure variations of the instrument and of the environment as well. Better results than those obtained by extrapolating the model to zero distance cannot be expected with the same devices in the same area. The efficiency of the network must be given in a relative sense, eliminating the disturbing influences of all exposure variations. (Knapp-USGS)
W72-08940

CONTROLLED ATMOSPHERIC CONVECTION IN AN ENGINEERED STRUCTURE,
Massachusetts Inst. of Tech., Cambridge.

V. P. Starr, D. A. Anati, and N. E. Gaut.
Nordic Hydrology, Vol 3, No 1, p 1-21, 1972. 1 fig.
NSF Grant GA-1310X.

Descriptors: *Convection, *Rainfall, *Artificial precipitation, *Weather modification, Condensation, Air circulation, Atmosphere, Heat transfer, Mass transfer, Humidity, Momentum transfer.
Identifiers: *Aerology.

The momentum theorem of classifical hydrodynamics is applied to a scheme for controlled atmospheric convection within a vertical tube of large height and diameter, open at both ends, for which the name aerological accelerator is suggested. The interior thermodynamic process is moist adiabatic, although departures from this ideal case must be considered. Condensation and consequent latent heat release renders unnecessary any external drive, save for a proper supply of moist air. The most important practical application of the device is the production of fresh water from atmospheric water vapor. A year of daily soundings from the aerological station at Brownsville, Texas, is analyzed to examine the probable success of the procedure. The theoretical results are encouraging, but questions and problems remain. (Knapp-USGS)
W72-09003

POLE-TO-POLE WATER BALANCE FOR THE IGY FROM AEROLOGICAL DATA,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 02A.
W72-09004

MULTIVARIATE RAINFALL GENERATOR FOR ANNUAL, SEASONAL, MONTHLY, AND DAILY EVENTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-09083

2C. Snow, Ice, and Frost

NATURAL AND MAN-INDUCED DISTURBANCES OF PERMAFROST TERRANE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
R. K. Haugen, and J. Brown.
In: Environmental Geomorphology, Proceedings of 1st Annual Geomorphology Symposia Series, held at Binghamton, N Y, Oct 16-17, 1970: State University of New York at Binghamton, Publications in Geomorphology, p 139-149, August 1971. 7 fig, 7 ref.

Descriptors: *Permafrost, *Environmental effects, Environmental engineering, *Land use, Thawing, Land subsidence, Frozen ground, Arctic, Cold regions, Ice, Tundra, Geomorphology.
Identifiers: Environmental protection (Permafrost).

The extreme sensitivity of permafrost terrane to disturbance is particularly evident in the ice-rich permafrost regions of Alaska. Problems arise because of the fragile equilibrium between the surface cover and the underlying wet soils and permafrost. The susceptibility of permafrost terrane to degradation is primarily related to the insulation qualities of the surface layer, and the ice content of the frozen soil beneath it. In the north where the surface organic layer is the thinnest and the ice content of the soil is highest, sensitivity to disturbance is the greatest. In the southern permafrost zones, the organic mat is thicker, underground ice is discontinuous and often without surface expression, so the likelihood of degradation effects is more difficult to predict. In study plots. ground temperatures under various surface treatments have been measured over a period of years, as well as the present condition of disturbances which occurred many years ago. Some engineering practices which permit human activity with minimum permafrost degradation are summarized. (See also W72-08510) (Knapp-USGS)
W72-08515

STREAMFLOW RECORDS OF THE SNOWY MOUNTAINS REGION, AUSTRALIA, 1966 TO 1970.
For primary bibliographic entry see Field 07C.
W72-08517

TRACE METAL ASSOCIATIONS IN SUB-ARCTIC AND ARCTIC MARINE ENVIRONMENTS. WORK IN PROGRESS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05A.
W72-08550

LIST AND LOCATION OF SNOW COURSES AND SOIL MOISTURE STATIONS.
Colorado Agricultural Experiment Station, Fort Collins.

Available from NTIS, Springfield, Va, 22151 as N71-36756-Price $3.00 paper copy; $0.95 microfiche. 1971. 16 p, 8 fig, 8 tab.

Descriptors: *Snow surveys, *Soil moisture, *Stations, *Colorado, *New Mexico, Watersheds, Networks, Data collections, Hydrogeology, Indexing, Sites, Elevation, Documentation.

A list of 225 snow courses and soil moisture stations in Colorado and New Mexico shows the location and elevation for each station. The watersheds included in the list are: in Colorado--South Platte River, Arkansas River, Upper Rio Grande, Gunnison River, Colorado River, Yampa River, White River, and North Platte River; in New Mexico--the Rio Grande; and in Colorado and New Mexico--San Miguel River, Dolores River, and San Juan River. (Woodard-USGS)
W72-08814

LANDSCAPE OF NORTHERN GREENLAND,
Geological Survey, Arlington, Va. Military Geology Branch.
W. E. Davies.
Army Cold Regions Research and Engineering Laboratory Special Report 164, March 1972. 67 p, 23 fig, 7 plate, 1 tab, 78 ref. ARPA Order 1615.

Descriptors: *Topography, *Geomorphology, *Aerial photography, *Arctic, Cold regions, Polar regions, Tundra, Permafrost, Terrain analysis, Mapping, Military aspects, Surveys, Topographic mapping.
Identifiers: *Greenland.

The terrain, geomorphology, physiography and general environmental setting of Northern Greenland are described. A new physiographic classification for Northern Greenland is proposed. Three basic concepts have been followed in establishing the physiographic divisions: (1) the divisions have been established to be applicable to all of Greenland; (2) they have been correlated as far as practicable with those already established in Canada; and (3) to be systematic, they follow the general criteria and scheme established by Fenneman and others for the United States. A terrain classification of this area is also presented with an emphasis toward cross-country operation of air cushion vehicles. A number of specific conditions are discussed such as: landform; terrain, including relief and slope relief features, their height, spacing and orientation; stream frequency; vegetation; soil types; and winter conditions. Additional information is provided on relief and conditions associated with summer and winter shore ice. The detailed geomorphology of five selected areas was mapped at scales of 1:100,000. (Knapp-USGS)
W72-08822

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: DANVILLE, VERMONT,
Agricultural Research Service, Danville, Vt. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02B.
W72-08919

SNOW AND ICE MELT AS INDICATORS OF HYDROLOGIC CONDITIONS, EXPLORATORY STUDY,
South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 02F.
W72-08999

HYDROGEOLOGY OF THE FROZEN ZONE OF THE LITHOSPHERE (OSOBENNOSTI GIDROGEOLOGII MERZLOY ZONY LITOSFERRY),
N. A. Vel'mina.
Izdatel'stvo 'Nedra', Moscow, 1970. 326 p.

Descriptors: *Hydrogeology, *Geomorphology, *Frozen ground, *Permafrost, *Groundwater, Groundwater basins, Groundwater movement, Groundwater recharge, Aquifers, Alluvial aquifers, Artesian aquifers, Water types, Springs, Rivers, Valleys, Rocks, Freezing, Thawing, Classification, Investigations.
Identifiers: *USSR, *Siberia, *Cryohydrogeology, *Geocryology, *Lithosphere, Patterned ground, Ground ice, Ice lenses, Taliks, Thermokarst.

A study of the hydrogeology of the frozen zone of the lithosphere, which covers about one-half of the USSR and about 80% of Siberia, was based on investigations in the Arctic, Soviet Far East, Chukot National District, Transbaikalia, and Central, Southern, and Eastern Yakutsk ASSR. Special attention is given to the occurrence, movement, recharge, and discharge of groundwater and to its classification, based on its relation to frozen ground and surrounding rocks and on its subsurface distribution. Three groundwater zones are distinguished: (1) an upper zone above the permafrost, containing seasonally circulating infiltrated water and meltwater; (2) a middle zone within the permafrost, containing waters in unfrozen layers (taliks); and (3) a lower zone beneath the permafrost. Criteria for the classification of ground ice in frozen rocks below the earth's surface are based on origin of the ice body (formed in the ground or on the surface and later buried) and the origin of the water (precipitation or groundwater). (Josefson-USGS)
W72-09007

RELICT PERMAFROST MICRORELIEF IN THE UPPER VOLGA BASIN,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
V. V. Berdnikov.
Geomorphology, No 4, p 327-332, October-December 1970. 4 fig, 10 ref, (Translated from Geomorfologiya, No 4, p 63-70, October-December 1970).

Descriptors: *Geomorphology, *Topography, *River basins, *Permafrost, Frozen soils, Ice, Frost heaving, Thawing, Pleistocene epoch, Slopes, Alluvium, Humus, Aerial photography.
Identifiers: *European USSR, *Yaroslavl' Oblast, *Volga River, *Relict permafrost, Polygon ground, Hillocks, Depressions (Topography).

The concept of the existence of a broad zone of permafrost in the European part of the USSR in the late Pleistocene has recently been confirmed by specific studies carried out in the upper Volga Basin. Investigations conducted in the Breytovo Rayon of the Yaroslavl' Oblast studied the microrelief of hillocks and depressions in the northern area of occurrence of the relict cryogenic morphosculpture. The area chosen from aerial photographs is approximately 500 m west of Du-

betz and has a surface inclined slightly toward the east; the elevation is 111-112 m. A system of hillocks and depressions caused by a relict permafrost polygon system was discovered in the area. The system is a relict hillock and depression microrelief, which is a newly studied type in the series of forms of relict permafrost morphosculpture. (Josefson-USGS)
W72-09008

CHENA RIVER LAKES FLOOD CONTROL PROJECT, FAIRBANKS, ALASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 08D.
W72-09035

WINTER OROGRAPHIC CLOUD MODIFICATION EXPERIMENT IN THE ROCKY MOUNTAINS OF COLORADO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
National Science Foundation, Washington, D.C.
For primary bibliographic entry see Field 03B.
W72-09040

CARBON DIOXIDE IN THE SURFACE WATERS OF THE BARENTS SEA: SOUTHWIND EXPEDITION - 1970,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05A.
W72-09099

CARBON DIOXIDE AND PRIMARY PRODUCTIVITY IN THE GLACIAL FIORD SYSTEM OF SOUTHEAST ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05C.
W72-09122

2D. Evaporation and Transpiration

PREDICTING LAKE EVAPORATION BY PERFORMANCE OF EVAPORATION PONDS, PANS AND TANKS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
J. B. Allen, and F. R. Crow.
American Society of Agricultural Engineers Transactions, Vol 14, No 3, p 458-463, May-June 1971. 14 fig, 3 tab, 9 ref.

Descriptors: *Evaporation, *Lakes, *Reservoir evaporation, *Evaporimeters, Data collections, Evaporation pans, Instrumentation, Temperature, Humidity.
Identifiers: Lake Hefner (Okla).

Evaporation records were analyzed at Lake Hefner, Oklahoma, for sunken 9-ft and 15-ft tanks adjacent to the lake and for a 0.28-acre pond located 60 miles northeast of the lake. The average lake:tank evaporation ratio for both the 15-ft and 9-ft tanks was 1.01. The average lake:pond evaporation ratio was 1.03 in 1965 and 1.17 in 1966. The lake:tank and lake:pond evaporation ratios increased during the fall of the year because the pond and tanks cooled more rapidly than the lake. The 15-ft tank and the 0.28-acre pond had similar evaporation rates despite the 60-mile distance between their locations. The 15-ft tank provided as good an estimate of lake evaporation as did the 0.28-acre-pond. Evaporation from Lake Hefner can be estimated by an equation which expresses lake evaporation as a function of the product of 9-ft or 15-ft tank evaporation and the ratio of the vapor-pressure deficits over the lake and the tank, respectively. (Knapp-USGS)
W72-08523

ACTUAL EVAPOTRANSPIRATION AS DETERMINED FROM SOIL-WATER AND CANOPY CHARACTERISTICS AND POTENTIAL EVAPOTRANSPIRATION.
Wisconsin Univ., Madison. Dept. of Soil Science.

Available from the National Technical Information Service as COM-72 10002, $3.00 in paper copy, $0.95 in microfiche. Progress Report for period June 1, 1970 through May 31, 1971, 63 p; August 1971. ESSA Grant No E-287-68 (G).

Descriptors: *Experimental farms, *Onions, *Crop response, *Research facilities, *Water balance, Seeds, Soil moisture, Temperature, Winds, Stomata, Evaporation, Transpiration, Projects, Evaluation, Soil-water-plant relationships, Horticultural crops.
Identifiers: *Research projects, Seed onion field.

Three aspects of the environment of field grown seed onions were studied: the water balance of a seed onion field, the onion plants' thermal regime, and the changes in the plant environment produced by screened breeding cages. Transpiration and evaporation from the soil from an onion field were determined separately by a combination equation method which also was found applicable to snap beans and should be applicable to many row crops. Onion transpiration was only about 20% of evapotranspiration and of this amount umbels leaves, and scapes accounted for 3%, 42%, and 55%, respectively. When wind speed, direction, air temperature, and sun angle are known, umbel temperatures can be predicted within 2 to 3 C. Solar radiation, wind, and air temperature regimes inside and outside of green and white Saran screen-covered breeding cages were examined. Light spectral distributions in the photosynthetic range were unaffected by screens. Wind velocity decreased 30% across each screen wall and decreased linearly with distance inside cages. Air temperatures inside isolated/cages differ little from those outside. (See W72-08721 thru W72-08727) (Woodard-USGS)
W72-08720

WATER BALANCE OF A SEED ONION FIELD,
Wisconsin Univ., Madison. Dept. of Soil Science.
S. M. Goltz, C. B. Tanner, A. A. Millar, and A. R. G. Lang.
Chapter I of Actual Evapotranspiration as Determined from Soil-Water and Canopy Characteristics and Potential Evapotranspiration, Progress Report p I1-I14, August 1971. 4 fig, 4 tab, 8 ref. ESSA Contract No E-287-68 (G).

Descriptors: *Water balance, *Onions, *Crop response, *Seeds, *Experimental forms, Environmental effects, Stomata, Evapotranspiration, Evaporation, Winds, Soil moisture, Temperature, Projects, Evaluation, Soil-water-plant relationships, Horticultural crops.
Identifiers: *Research projects, *Seed onion field.

Transpiration, evaporation, and drainage from a sparsely populated onion field were measured separately by a method which should be applicable to many row crops. Transpiration computed from measured evapotranspiration, potential evaporation, and stomatal resistances agreed well with values calculated independently from measured stomatal resistance, air vapor pressure, plant-temperature and wind. Transpiration was only about 20 percent of total evapotranspiration. When the population was increased threefold to near maximum commercial density, evapotranspiration increased only about 15 percent because as transpiration increased, evaporation decreased. The portion of transpiration accounted for by each plant part was 3 percent for umbels, 42 percent for leaves and 55 percent for scapes. Drainage from this sandy soil exceeded evapotranspiration. (See also W72-08720) (Woodard-USGS)
W72-08721

EXCESSIVELY HIGH TEMPERATURES OF SEED ONION UMBELS,
Wisconsin Univ., Madison. Dept. of Soil Science.
C. B. Tanner, and S. M. Goltz.
Chapter II of Actual Evapotranspiration as Determined from Soil-Water and Canopy Characteristics and Potential Evapotranspiration; Progress Report p II1-I114, August 1971. 9 fig, 1 tab, 9 ref. ESSA Contract No E-287-68 (G).

Descriptors: *Experimental farms, *Onions, *Seeds, *Heat, *Crop response, Temperature, Heat transfer, Water balance, Winds, Velocity, Wisconsin, Idaho, Evapotranspiration, Mathematical studies, Equations, Forecasting, Projects, Stomata, Leaves.
Identifiers: *High temperatures, *Onion umbels, Research projects.

High temperatures may adversely affect onion seed production since the occurrence of physiological damage to the umbel, resembling sunscald, is associated with a reduction in the number of viable seeds produced. The portion of the umbel directly facing the sun is the hottest plant part. Ovary temperatures as high as 60 C (140 F) have been observed at the 'hot spot,' which would denature many plant enzymes. A method was developed for estimating the maximum and minimum possible temperature of the umbel 'hot spot' using only air temperature and wind speed. This method was successful in predicting maximum and minimum umbel temperatures measured at Parma, Idaho. The temperature rise of the hot spot above air temperature is inversely proportional to the 2/3 power of wind speed. (See also W72-08720) (Woodard-USGS)
W72-08722

SEED ONION TEMPERATURES AND THEIR EFFECT ON STOMATA,
Wisconsin Univ., Madison. Dept. of Soil Science.
S. M. Goltz, and C. B. Tanner.
Chapter III of Actual Evapotranspiration as Determined from Soil-Water and Canopy Characteristics and Potential Evapotranspiration; Progress Report p III1-III7, August 1971. 4 fig, 6 ref. ESSA Contract No E-287-68 (G).

Descriptors: *Experimental farms, *Onions, *Seeds, *Stomata, *Air temperature, Crop response, Evaporation, Leaves, On-site investigations, Wisconsin, Idaho, Soil-water-plant relationships.
Identifiers: *Seed onions temperatures, Daytime temperatures, Nightime temperatures, Temperature effects.

Stomatal diffusion resistances and temperatures of seed onion scapes and leaves were measured in the field both in Wisconsin and Idaho. A minimum resistance occurred at about 30C with a strong increase in resistance at lower temperatures and more moderate increase at higher temperatures. During daytime in Wisconsin interior scape temperatures were as much as 7C above air temperature, while umbel center temperatures and mean leaf temperatures were seldom more than 2C above air temperature. During the night, plant temperatures were within 1C of air temperature. (See also W72-08720) (Woodard-USGS)
W72-08723

ENERGY, WIND, AND AIR TEMPERATURE RELATIONS OF SCREENED BREEDING CAGES,
Wisconsin Univ., Madison. Dept. of Soil Science.
S. M. Goltz, and C. B. Tanner.
Chapter IV of Actual Evapotranspiration as Determined from Soil-Water and Canopy Characteristics and Potential Evapotranspiration; Progress Report p IVI-IVI0, August 1971. 4 fig, 3 tab, 3 ref. ESSA Contract No E-287-68 (G).

Descriptors: *Experimental farms, *Horticultural crops, *Seeds, *Plant breeding, *Environmental effects, Analytical techniques, Soil-water-plant relationships, Solar radiation, Winds, Air temperature, Projects, Evaluation, Correlation analysis.
Identifiers: *Seed breeding cages, Research project.

Solar radiation, wind, evaporation rates and air temperature regimes inside and outside of green and white Saran screen-covered breeding cages for horticultural crops were examined. Manufacturer's specifications of 43% and 20% actual shade were confirmed by transmittance measurements at high sun angles; however transmittance decreased (shade increased) with decreasing sun angles. Incident beam radiation and diffuse radiation were attenuated differently. Spectral energy distributions were unaffected by screens. Wind velocity decreased 30% across each screen wall and decreased linearly with distance inside cages. Under usual winds, air temperature inside isolated cages can differ very little from outside temperature. These temperatures may differ more within cages set in large arrays. Plant temperatures inside cages may differ substantially from those outside but differences would depend on solar radiation, transmission of the screen, transpiration rates, and windspeed in the cage. (See also W72-08720) (Woodard-USGS)
W72-08724

ONION FIELD EVAPOTRANSPIRATION MEASURED BY BOWEN RATION AND LYSIMETER.
Wisconsin Univ., Madison. Dept. of Soil Science.

Appendix 1 of Actual Evapotranspiration as Determined from Soil-Water and Canopy Characteristics and Potential Evapotranspiration Progress Report p A1-1-A1-6, August 1971. 1 fig, 2 tab, 1 ref. ESSA Contract No E-287-68 (G).

Descriptors: *Experimental farms, *Onions, *Evapotranspiration, *Water balance, *Data collections, Methodology, Lysimeters, Soil-water-plant relationships, Water vapor, Heat transfer, Temperature, Diffusivity, Correlation analysis, Mathematical studies, Horticultural crops.
Identifiers: *Evapotranspiration rates, Bowen ratio.

Evapotranspiration rates obtained from a weighing lysimeter were used in studying the water balance of a seed onion field. During part of the time lysimeter measurements were made, independently determined evapotranspiration rates were calculated from Bowen ratio and energy balance data. Agreement in values indicate that lysimeter data adequately represent onion field vapor flux and also that the Bowen ratio method can be used with this type of surface. The Bowen ratio method assumes that the eddy diffusivities of heat and water vapor are equal, that fetch is sufficient to provide adjustment of the atmospheric surface layer with the surface so that vertical profiles of water vapor and temperature represent the surface, and that heterogeneity of sources and sinks of water vapor and heat of the row crop does not affect the measurement. (See also W72-08720) (Woodard-USGS)
W72-08725

A COMPARISON OF TWO WAYS OF USING A METHOD FOR CALCULATING ROW CROP TRANSPIRATIONS,
Wisconsin Univ., Madison. Dept. of Soil Science.
S. M. Goltz, and C. B. Tanner.
Appendix 2 of Actual Evapotranspiration as Determined from Soil-Water and Canopy Characteristics and Potential Evapotranspiration; Progress Report p A2-1-A2-8, August 1971. 1 tab, 2 ref. ESSA Contract No E-287-68 (G).

Descriptors: *Experimental farms, *Horticultural crops, *Transpiration, *Analytical techniques, Evaporation, Soil-water-plant relationships, Evapotranspiration, Mathematical studies, Equations, Soil moisture, Data collections, Correlation analysis.
Identifiers: *Row crop transpiration, Crop transpiration resistance.

The transpiration of row crops can be determined using the combination method provided the crop transpiration resistance and evaporation from the soil is known. If evapotranspiration also is measured, both transpiration and evaporation can be found. If transpiration is found by estimating evaporation from the soil, errors in estimating evaporation do not critically affect calculations of transpiration, as long as potential evaporation greatly exceeds evaporation from the soil. At typical field temperatures, transpiration calculated this way becomes critical of small errors in the ratio of atmospheric transfer resistance to transpiration resistance when this ratio exceeds about three to four. Calculations of transpiration using measured evapotranspiration can be employed under more varied conditions. Calculations for snap beans are shown both ways. (See also W72-08720) (Woodard-USGS)
W72-08726

ONION UMBEL TEMPERATURE PROFILES AND TRANSPIRATION RATES.

Appendix 3 of Actual Evaporation as Determined from Soil-Water and Canopy Characteristics and Potential Evapotranspiration; Progress Report p A3-1-A3-4, August 1971. 1 fig, 1 tab, 2 ref. ESSA Contract No E-287-68 (G).

Descriptors: *Experimental farms, *Onions, *Soil-water-plant relationships, *Transpiration, *Temperature, Data collections, Solar radiation, Evapotranspiration, Leaves, Methodology, Mathematical studies, Equations, Correlation analysis, Horticultural crops.
Identifiers: *Transpiration rates, *Onion umbel, Temperature profiles.

Temperature profiles along onion umbel diameters were measured along with umbel transpiration rates. On the assumption that all the heat flowing into the umbel is used for transpiration, transpiration rates were calculated from the measured temperature profiles, umbel radius, and theoretically estimated umbel thermal conductivity. The results indicate that transpiration may not occur uniformly within the umbel, the florets may account for a portion of the transpiration, and that radiant energy must be transmitted into the umbel interior to account for measured transpiration rates. (See also W72-08720) (Woodard-USGS)
W72-08727

QUANTITATIVE EVALUATION OF TRANSPIRATION OF COTTON PLANTS (IN RUSSIAN),
L. P. Lapshova.
Dokl Akad Nauk Tadzh Ssr. 13 (5): 52-54. 1970.
Identifiers: Cotton-D, Penetrability, Period, Plants, Protoplasm, Quantitative, Transpiration, Vegetative.

The transpiration of cotton fields increased proportionately starting from the beginning of vegetation of the fruit-forming period of cotton plants. Starting from ripening, transpiration intensity decreased due to decreased penetrability of the protoplasm. The ratio between transpiration and total evaporation in cotton fields also was established. Transpiration increased 30-40% in the budding-blooming period, 75-80% in the fruiting-ripening period and decreased 50-40% in the harvesting period.--Copyright 1972, Biological Abstracts, Inc.
W72-08748

INFLUENCE OF SOIL WATER STRESS ON EVAPORATION, ROOT ABSORPTION, AND INTERNAL WATER STATUS OF COTTON,
Texas A and M Univ., College Station. Dept. of Plant Sciences; and Agricultural Research Service, Temple, Tex. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 03F.
W72-08897

GLOBAL EXCHANGE OF ENERGY AND MATERIAL,
State Oceanographic Inst., Moscow (USSR).
For primary bibliographic entry see Field 02A.
W72-08901

EVAPOTRANSPIRATION IN THE GREAT PLAINS.

Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; Manhattan, Kansas State University, Agricultural Experiment Station, 1970. 401 p.

Descriptors: *Conferences, *Evapotranspiration, *Great Plains, Research and development, Data collections, Hydrologic data, Meteorological data, Climatic data, Weather data, Advection, Climatology, Meteorology, Microclimatology, Energy budget, Heat balance, Water balance.

A seminar was held for the purpose of providing insights and guidelines for developing a Great Plains regional research project on evapotranspiration ET. The following questions were discussed: (1) The adequacy of information concerning the water balance in the Great Plains, (2) The technical possibility of reducing ET significantly, (3) Standardized measurements of ET on a Plains-wide basis, (4) A predictive ET model on a wide area basis that would have application to the differing climate from north to south, and (5) A regional research approach. (See W72-08921 thru W72-08939) (Knapp-USGS)
W72-08920

ESSA: A DISSEMINATOR AND USER OF ET DATA,
Environmental Data Service, Silver Spring, Md. Lab. for Environmental Data Search.
G. L. Barger, T. L. Noffsinger, J. J. Rahn, and W. C. Palmer.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 1-6, 1970.

Descriptors: *Information exchange, *Great Plains, *Data collections, Evapotranspiration, Networks, Data storage and retrieval, Basic data collections, Meteorological data, Hydrologic data, Investigations, On-site data collections, Weather data, Climatic data, Instrumentation.

Annual precipitation across the United States averages about 30 inches. Of this amount approximately 21 inches, or 70% of the total, is returned to the atmosphere through the evapotranspiration process. Thus, water loss by evaporation and transpiration represents a sizable and important portion of the annual water budget. Thus, there is a need for routine information on potential and actual evapotranspiration to complement our extensive network of precipitation reporting stations. At present, however, no regular reporting network for ET data exists, and what data are collected are used almost exclusively for specific research purposes. The Environmental Data Service (EDS) and Weather Bureau (WB) within ESSA have a primary function of collecting, interpreting and disseminating meteorological data. The WB handles synoptic weather information and has responsibility for issuing forecasts and warnings, while EDS is the climatological arm of ESSA, processing data for design and planning assistance. The specific requirements for ET data will of course vary with the user, depending on the ultimate purpose. The final design of a data network is a compromise based on need and economy. As a minimum, ESSA suggests that the network include the main agricultural experiment stations and all substations within each State. Such a network would include approximately 260 stations across the United States. (See also W72-08920) (Knapp-USGS)
W72-08921

EVAPOTRANSPIRATION AND SOIL CONSERVATION SERVICE IRRIGATION OPERATIONS,
Soil Conservation Service, Washington, D.C. Engineering Div.
R. H. Brownscombe.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 13-17, 1970. 3 ref.

Descriptors: *Evapotranspiration, *Irrigation water, *Irrigation design, *Great Plains, Irrigation programs, Irrigation systems, Consumptive use, Water utilization, Climatic data, Hydrologic data, Data collections.

Only one-half the irrigation water delivered to farms is consumptively used. The other half, besides requiring as much effort and expense in handling, may cause soil loss, waterlogging, leaching of nutrients, and water quality deterioration. Knowledge of evapotranspiration is a first step to more effective and less damaging use of irrigation water. The Soil Conservation Service is concerned with the use of evapotranspiration data for determining the design capacity of farm and farm-group irrigation systems, and for scheduling the time and the amount of water to be applied in operation of these systems. A method is needed for estimating daily evapotranspiration rates whose accuracy is consistent with the other factors used in the irrigation water requirement equation. The method also should be widely applicable, simple, and based on readily available climatic data. (See also W72-08920) (Knapp-USGS)
W72-08922

RELATIONSHIP OF EVAPOTRANSPIRATION TO BUREAU OF RECLAMATION PROJECT PLANNING AND OPERATIONS,
Bureau of Reclamation, Washington, D.C. Div. of Water and Land Operations.
M. N. Langley, and C. LeMoyne, Jr.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 19-27, 1970. 11 ref.

Descriptors: *Evapotranspiration, *Irrigation water, *Irrigation design, *Great Plains, Irrigation programs, Irrigation systems, Consumptive use, Water utilization, Climatic data, Hydrologic data, Data collections.

Although crop consumptive use is the basic part of the irrigation requirement, it may be a minor portion of the total water which is diverted for irrigation. Storage system losses, conveyance system losses, evaporation from water surfaces, consumptive use of noncrop plants, surface runoff, deep percolation losses, and leaching water requirements are other components of the total irrigation diversion requirement. Two near-term possibilities exist for irrigators to save water. First, increase the efficiency of irrigation systems, and second, develop means for achieving more efficient use of water on the farm. Irrigation efficiency can be increased by advanced system design, and water use can be made more efficient by adopting practical methods of irrigation scheduling and automation of farm irrigation systems. These changes need to be coupled to advances in knowledge concerning evapotranspiration. (See also W72-08920) (Knapp-USGS)
W72-08923

THE USE OF EVAPOTRANSPIRATION INFORMATION IN THE FOREST SERVICE,
Forest Service (USDA), Denver, Colo. Rocky Mountain Region.
J. E. Reid.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 29-34, 1 fig, 5 ref.

Descriptors: *Evapotranspiration, *Water balance, *Forestry, *Great Plains, *National forests, Trees, Consumptive use, Water utilization, Data collections, Hydrologic data, Climatic data, Parks, Land use, Forests.

Forest Service activities cover management, protection, and development of the National Forests and National Grasslands; cooperation with State and private forest owners in obtaining better forestry; and research needed for forest and forested rangelands. The use of evapotranspiration information in each of these three areas has similar characteristics. The major use of evapotranspiration information in the Forest Service is in the evaluation of management alternatives and their effect on wood, forage, water, recreation, and wildlife produced in the forests and grasslands of the Great Plains area. (See also W72-08920) (Knapp-USGS)
W72-08924

USE OF EVAPOTRANSPIRATION INFORMATION BY STATE WATER RESOURCE AGENCIES,
Texas Water Development Board, Austin.
P. T. Gillett.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 41-44, 1970.

Descriptors: *Evapotranspiration, *Texas, *Irrigation, *Consumptive use, *Great Plains, Water demand, Inter-basin transfers, Climatic data, Hydrologic data, Data collections, Water resources development.
Identifiers: *Texas Water Plan.

Evapotranspiration information is essential to basic functions of state water-resource agencies. Broadly these functions are water-resource planning and development, and water-resource use, operation, and management. In some degree, evapotranspiration is a factor to be considered in each. An adequate fund of knowledge about it is essential for dependable plans, development, effective operation, and management. Two-thirds of Texas irrigation is on the Great Plains, supported almost entirely with groundwater from the Ogallala aquifer. This water source is not being appreciably recharged naturally, so future supply and use are critical concerns. Importation for augmenting surface-water supplies is being studied. Irrigation water requirements need to be computed, and evapotranspiration data, regardless of method of computation, are essential. (See also W72-08920) (Knapp-USGS)
W72-08925

THE SYSTEMATIC APPROACH TO ET MODELING IN THE GREAT PLAINS,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
J. F. Stone.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 45-54, 1970. 3 fig, 8 ref.

Descriptors: *Evapotranspiration, *Great Plains, *Model studies, Water management (Applied), Systems analysis, Mathematical models, Hydrologic data, Data collections, Texas.

The agricultural benefits of modeling of evapotranspiration are conservation of water for runoff and impoundment in liquid reserves, understanding how to make plants thrive on less water, and enhancing agricultural production. The ranges of the variable factors and the magnitudes of the parametric factors vary over a region as large as the Great Plains. In the Great Plains evapotranspiration is an important part of the hydrologic cycle because of the area's continental climate and semiarid condition. Man's control of alternative fates of water can regulate the future of the Great Plains region as well as have an impact on the entire country. (See also W72-08920) (Knapp-USGS)
W72-08926

AN EVAPOTRANSPIRATION MODEL FOR GREAT PLAINS GRASSLANDS,
Texas A and M Univ., College Station. Dept. of Range Science.
W. G. McCully, and R. H. Haas.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushlans, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 55-65, 1970. 1 fig, 49 ref.

Descriptors: *Evapotranspiration, *Great Plains, *Grasslands, *Water balance, Runoff, Infiltration, Evaporation, Land management, Transpiration, Hydrologic budget.

Grasslands comprise 64% of the 341 million acres of agricultural land assigned as the Great Plains. The plant growth changes progressively from tallgrass along the eastern boundary through midgrass to shortgrass in the drier western regions. Yield declines as plant height decreases, and is directly proportional to available soil moisture but inversely proportional to the evaporative power of the air. The major portion of the precipitation falling on the Great Plains occurs during the summer period. Less than 10% of this precipitation results in runoff. The water balance method is most feasible for expressing evapotranspiration in grasslands of the Great Plains. Precipitation is measured directly and must be accounted for by specific time period. Unsaturated flow into the root zone is considered to be negligible for most rangeland conditions and for most practical purposes can be ignored. Runoff from the surface may be small under most rangeland conditions; however, it may become an important consideration in comparing sites, seasons, range condition and degree of use. Drainage through percolation or lateral flow may be minor on most rangeland sites, but the possibility of loss due to this factor should not be ignored where comparisons are made among sites, seasons or range condition. Changes in soil water must be measured very accurately to avoid significant error in ET calculations. (See also W72-08920) (Knapp-USGS)
W72-08927

IRRIGATION-ORIENTED ET MODELS FOR THE GREAT PLAINS,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
M. E. Jensen, and J. L. Wright.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 67-78, 1970, 8 ref.

Descriptors: *Evapotranspiration, *Great Plains, *Mathematical models, *Irrigation, Model studies, Research and development, Water management (Applied), Soil-water-plant relationships.

An evapotranspiration (ET) model is a mathematical expression relating the major climate, crop, and soil variables to ET. Modeling enables researchers to develop more rigorous hypotheses before establishing experiments, thereby minimizing wasted effort. Decision-making output consists of current daily ET values, not over 2 days old with cumulative resulting effects of previous 3- to 60-day periods. The output also includes forecasts of ET and ET effects. These data are extremely valuable to the modern farm and project managers. Historical ET output is developed from climatic data collected in previous seasons and is the most common type provided today. Interaction output represents the combined effects of various climates, crops, and soils. A decision-making ET model was developed and has been tested for several years in Idaho, Arizona, and the Great Plains. There are many historical-data ET models

in use. The development of practical ET models for providing decision-making data to the farm manager has a tremendous potential to Great Plains agriculture and research. (See also W72-08920 (Knapp-USGS)
W72-08928

EVAPOTRANSPIRATION MODEL FOR DRYLAND CROPS FOR THE GREAT PLAINS,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.
D. F. Heermann, and H. R. Gardner.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 79-109, 1970. 14 fig, 3 tab, 5 ref.

Descriptors: *Evapotranspiration, *Great Plains, *Mathematical models, *Irrigation, Model studies, Research and development, Water management (Applied), Soil-water-plant relationships.

A computer program was written for simulating dryland evapotranspiration. A total of 30 plots and lysimeters were simulated. The primary crop was grain sorghum, with data from 1968 and 1969. In 1968 both dryland and irrigated plots were observed. Two plots and one lysimeter of oats were also available for the simulation. The average error in estimating the season evapotranspiration was 7% for dryland grain sorghum in 1969. The model establishes a maximum volume of water that can be withdrawn from the soil profile and estimates the exact amount of water used if the soil reaches the permanent wilting point. (See also W72-08920) (Knapp-USGS)
W72-08929

EVAPOTRANSPIRATION COMPONENTS OF WATERSHED MODELS FOR THE GREAT PLAINS,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.
D. A. Woolhiser, R. E. Smith, and C. L. Hanson.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee, Publication No 50; p 111-136, 1970. 12 fig, 1 tab, 11 ref.

Descriptors: *Evapotranspiration, *Great Plains, *Mathematical models, *Irrigation, Model studies, Research and development, Water management (Applied), Soil-water-plant relationships.

Mathematical models, belonging to the formal or intellectual class of models, are the primary tool in studies of watersheds and evapotranspiration processes, although material models may be used in conjunction with them. Evapotranspiration models used in watershed studies generally consist of a continuity equation, a means of estimating potential evapotranspiration, and a relationship between actual evapotranspiration, potential evapotranspiration, and the soil moisture content. In the Great Plains Region advected heat can be a very important consideration because of the spatial variability of rainfall and the concentration of water in stream channels and alluvium. Because of spatial variabilities of precipitation inputs, soil properties, and vegetation, it appears that evapotranspiration must be considered as a distributed rather than a lumped process on watersheds. The approach used in the Stanford watershed model allows for spatial variability by assuming that evapotranspiration has a statistical distribution over a watershed. In general, an evapotranspiration model must contain a soil moisture model. The moisture content of the top few inches of soil and the total moisture of the top few feet should both be known. (See also W72-08920) (Knapp-USGS)
W72-08930

REMOTE SENSING IN EVAPOTRANSPIRATION RESEARCH ON THE GREAT PLAINS,
Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research Div.
C. L. Wiegand, and J. F. Bartholic.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 137-180, 1970. 7 fig, 5 tab, 41 ref.

Descriptors: *Evapotranspiration, *Great Plains, *Remote sensing, Instrumentation, Data collections, Soil-water-plant relationships, Infrared radiation, Photogrammetry, Mapping, Photometry, Radar, Satellites (Artificial), Surveys, Terrain analysis.

Remote sensors can be used with ground measurements to gather regional evapotranspiration information. The major subjects in which more knowledge is needed are outlined in relation to large-scale evapotranspiration in the Great Plains. Sensed wavelengths, plant response in various wavelengths, and available sensors are reviewed. The capabilities of available and planned remote sensing vehicles and how the sensors aboard might satisfy needs are examined. The 8 to 14 micrometer wavelength interval is of greatest interest in evapotranspiration applications. (See also W72-08920) (Knapp-USGS)
W72-08931

SOIL MODIFICATION FOR IMPROVING PLANT-WATER RELATIONS AND EFFECTS ON ET,
Agricultural Research Service, Sidney, Mont. Northern Plains Soil and Water Research Center.
F. H. Siddoway, P. W. Unger, and A. D. Schneider.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 181-205, 1970. 5 fig, 8 tab, 29 ref.

Descriptors: *Evapotranspiration control, *Great Plains, *Evapotranspiration, *Mulching, Stubble mulching, Water conservation, Water management (Applied), Soil treatment, Soil-water-plant relationships.

Cultivated dryland agriculture is inefficient both in terms of soil water storage during the off-crop season and water use during the crop season. Most soil management methods designed to increase bulk storage of water in the root-zone profile are applied between harvest and planting of the next crop. Aside from controlling weeds, irrigation is the primary water management tool that has significant impact during the growth period. Furrowing, residue mulching, and terracing are exceptions. From an economic standpoint, crop residue is the most practical mulch. When soil can be temporarily and economically waterproofed over a period of a year, this system has great potential. Soil profile modification can sometimes be used when costs permit. (See also W72-08920) (Knapp-USGS)
W72-08932

SOIL WATER EVAPORATION,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
C. W. Wendt, T. C. Olson, H. J. Haas, and W. O. Willis.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 207-227, 1970. 66 ref.

Descriptors: *Evaporation control, *Land management, *Water conservation, *Great Plains, *Soil water, Soil water movement, Water loss, Water balance, Soil-water-plant relationships.
Identifiers: *Soil water evaporation.

In most parts of the Great Plains region, water tables are absent or deep, and soil water evaporation is a nonsteady-state process. Evaporation under these conditions occurs in three distinct stages. During the first stage, the evaporation rate is dependent on the potential evaporativity of the environment. The rate of the second stage of drying depends on the ability of the soil to transmit water to the soil surface. Evaporation losses during the third stage of drying depend on the rate of vapor transfer through a layer of air-dry soil. Nearly 80% of the precipitation from April to September can be lost by evaporation. Total water loss from harvest to seeding time of annually cropped wheat has averaged 75% of the precipitation at 25 experiment stations in the Great Plains. During the fallow period, the loss averaged 84% of total precipitation. The effect of evaporation control on crop yields has varied widely, ranging from a decrease of 24% to an increase of 183%. For maximum benefit, the evaporation control measures should be in effect during both the growing season and the noncropping period. In cropped areas, the best immediate potential to reduce evaporation losses is better plant arrangement based on soil water supply to provide more shading of the soil surface. Grassland areas would probably benefit from management practices that would allow a good plant cover. (See also W72-08920) (Knapp-USGS)
W72-08933

SPECIES, SOILS, CLIMATE, AND FERTILITY AS RELATED TO TOP GROWTH AND EVAPOTRANSPIRATION,
Nebraska Univ., Lincoln. Dept. of Agronomy.
R. A. Olson, J. K. Aase, and R. E. Meyer.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 229-253, 1970. 18 fig, 50 ref.

Descriptors: *Soil-water-plant relationships, *Great Plains, *Evapotranspiration control, *Evapotranspiration, Solar radiation, Winds, Land management, Water loss, *Water conservation, Water balance, Planting management, Plant growth.

The climatic factors that affect both evapotranspiration and top growth are radiation, temperature, vapor pressure, CO2, and wind ventilation. The soil factors are fertility, the various soil-moisture parameters of moisture-energy relationships, temperature, bulk density, and aeration. These factors are closely interrelated and have individual as well as interactive effects upon plants. In many cases it is not feasible or possible to modify the climatic factors to control evapotranspiration, but it may be possible to modify the interaction of the climatic factor with the plant. This has resulted in much interest in plant geometry, both aerial and subterranean. Changes in plant geometric relationships such as planting heights, plant height uniformity, and equilateral plantings can have profound effects upon the plant-climate interaction. (See also W72-08920) (Knapp-USGS)
W72-08934

EVAPOTRANSPIRATION AND ROOT GROWTH,
Montana State Univ., Bozeman. Dept. of Soils.
H. Ferguson, P. L. Brown, and D. W. Fryrear.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 255-274, 1970. 7 fig, 4 tab, 20 ref.

Descriptors: *Evapotranspiration control, *Planting management, *Soil-water-plant relationships, *Great Plains, *Root development, Evapotranspiration, Water conservation, Land management, Water loss, Water balance, Plant growth, Root distribution.

Agricultural practices in the Great Plains can influence root proliferation, and increased proliferation can increase efficiency of water use. Varietal differences in root proliferation probably also exist. Thus, there is reason to believe that cultural and genetic modification of rooting properties could be used to overcome some of the growth-limiting factors existing in the Great Plains. Several soil conditions can influence root proliferation. Soil layers that restrict root growth exist in many areas of the Great Plains. Fertility has a great effect on root growth. Other factors that may influence evapotranspiration and water utilization in the Plains are soil temperatures, dry soil profiles and dry zones within the profile. (See also W72-08920) (Knapp-USGS)
W72-08935

POTENTIAL FOR EVAPOTRANSPIRATION AND ITS MANIPULATION IN THE PLAINS REGION,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
N. J. Rosenberg, and W. L. Powers.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 275-299, 1970. 6 fig, 2 tab, 49 ref.

Descriptors: *Evapotranspiration, *Great Plains, Water balance, Advection, Solar radiation, Heat balance, Energy budget, Soil-water-plant relationships.
Identifiers: Possible evapotranspiration, Potential evapotranspiration.

Potential evapotranspiration is a difficult quantity to measure, particularly in arid and semi-arid regions. Yet farmers need to know something of the quantities of water use possible. Possibel evaporation is equivalent to the disposable energy available at the evaporating surface. Net radiation depends on the surface reflectivity, emissivity, and temperature. The quantity of net radiation available in any layer of a plant canopy depends on the leaf coverage and the optical properties of the leaf layer or layers above and below. Advection depends on the existence of an upwind source of excess sensible heat, upon wind movement and upon aerodynamic as well as humidity characteristics of the ambient air and of the surface. The prediction of possible ET on a local basis is very difficult. On a regional basis it may be conceptually simpler to understand possible ET although it is physically more difficult to accomplish the necessary measurements. Reduction of possible ET might be accomplished by a reduction of radiant energy and advective energy reaching the crop and soil surface. (See also W72-08920) (Knapp-USGS)
W72-08936

ROLE OF PLANT CANOPIES IN EVAPOTRANSPIRATION,
South Dakota State Univ., Brookings.
M. L. Horton, L. N. Namken, and J. T. Ritchie.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 301-338, 1970. 9 fig, 1 tab, 42 ref.

Descriptors: *Evapotranspiration control, *Great Plains, *Soil-water-plant relationships, Water balance, Energy budget, Planting management, Water conservation, Plant growth, Water loss.

Because plant canopy structure plays an important role in influencing evapotranspiration, modifying the canopy is a possible way to improve the efficiency with which energy and water are used to produce a product. If canopy configuration increases the dry matter yield or the marketable yield of a crop, water use efficiency is increased whether water is abundant or deficient at times during the growing season. The problem on dryland, where water limits production, is that the early season vegetative response of the crop to canopy density may not carry through to harvest. The soil-plant-atmosphere continuum can be modified for improved use of solar energy. Methods that might be effective include reflectors, shades, absorptive surfaces, reflective surfaces, and surface roughness. Soil moisture can be controlled through the use of irrigation, mulches, plastics, tillage or chemicals. Development of plants that permit the deepest light penetration into the canopy but prevent light from reaching the soil surface, development of varieties capable of withstanding the extreme of weather of the Great Plains, and, at the same time increasing the dry matter produced per unit of energy and water used are good fields for research. (See also W72-08920) (Knapp-USGS)
W72-08937

EVAPOTRANSPIRATION AND THE AERIAL ENVIRONMENT AS INFLUENCED BY WINDBREAKS,
Agricultural Research Service, Manhattan, Kans. Soil and Water Conservation Research Div.
E. L. Skidmore, and L. J. Hagen.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 339-368, 1970. 3 fig, 1 tab, 56 ref.

Descriptors: *Evapotranspiration, *Great Plains, *Windbreaks, *Crop response, Wind velocity, Turbulence, Evapotranspiration control, Winds, Evaporation, Microclimatology, Energy budget, Heat balance.

Windbreaks change the ambient airflow and thus modify the microclimate and affect crop yields. Characteristics of the wind that affect the influence of windbreaks include speed, direction, thermal stability, and turbulence level. With increased turbulence in the open-field wind, leeward windspeed distribution is more like that produced by a dense barrier. Other windbreaks, rough terrain, and thermal instability increase wind turbulence. Barrier characteristics that influence airflow most are permeability and height. Barriers with low permeability reduce windspeed close to the barrier but for less distance than more permeable ones. The distance sheltered by a barrier is proportional to its height. The reduced windspeed leeward of barriers generally reduces mixing and turbulent exchange of mass, momentum, and energy, and causes higher daytime air temperatures, lower nighttime air temperatures, higher humidity, more variation in CO2 concentration, lower evaporation rates, and beneficial snow distribution. The net effect of the barrier-induced microclimate in the harsh Great Plains is a more favorable crop environment that increases yields in sheltered areas. (See also W72-08920) (Knapp-USGS)
W72-08938

PANEL DISCUSSION ON REGIONAL NEEDS FOR EVAPOTRANSPIRATION RESEARCH IN THE GREAT PLAINS.
In: Evapotranspiration in the Great Plains, Seminar, March 23-25, 1970, Bushland, Texas, Great Plains Agricultural Council Research Committee Publication No 50; p 369-401, 1970.

Descriptors: *Conferences, *Evapotranspiration, *Great Plains, Research and development, Data collections, Hydrologic data, Meteorological data, Climatic data, Weather data, Advection, Climatology, Meteorology, Microclimatology, Energy budget, Heat balance, Water balance.

A panel discussion was held to explore the needs for regional evapotranspiration research in the Great Plains. The following questions were discussed: (1) The adequacy of information concerning the water balance in the Great Plains, (2) The technical possibility of reducing ET significantly, (3) Standardized measurements of ET on a Plains-wide basis, (4) A predictive ET model on a wide area basis that would have application to the differing climate from north to south, and (5) A regional research approach. The statements made by each panel member are printed in the order of presentation at the seminar. Following these statements is the floor discussion that took place after each panel member's statement. (See also W72-08920) (Knapp-USGS)
W72-08939

FOR A METHODOLOGY OF EVALUATIONS OF EVAPOTRANSPIRATION (POUR UNE METHODOLOGIE DES EVALUATIONS DE L'EVAPOTRANSPIRATION),
M. Bakalowicz, and G. Oberlin.
Journal of Hydrology, Vol 15, No 3, p 187-191, March 1972. 2 tab, 8 ref. English abstract.

Descriptors: *Evapotranspiration, *Analytical techniques, Estimating, Reviews, Climatology, Water balance, Meteorology, Evaporation, Soil-water-plant relationships.

Evaluating evapotranspiration in a river basin is an urgent and important problem which implies, among other things, an analysis and a comparison between different estimates. While comparing various methods, care must be taken to define homogeneous sets, which actually converge towards a common aim. For this reason, a few basic principles are given to guide the choice of homogeneity criteria. Review of evapotranspiration calculations shows that a few methods, the so-called combination formulae, have not led, so far, to the most desirable applications and tests, given their practical interest and easy use. (Knapp-USGS)
W72-08941

AN AERODYNAMIC FORMULA TO COMPUTE EVAPORATION FROM OPEN WATER SURFACES,
Saskatchewan Research Council, Saskatoon.
G. Lakshman.
Journal of Hydrology, Vol 15, No 3, p 209 225, March 1972. 17 fig, 1 tab, 15 ref, 2 append.

Descriptors: *Evaporation, *Winds, *Reservoir evaporation, Humidity, Climatology, Meteorology, Mass transfer, Advection, Temperature, Vapor pressure, Canada.
Identifiers: Aerodynamics.

A formula to compute evaporation from open water surfaces is derived using wind profile characteristics. The mass transfer coefficient is given as a function of the shape and size of the water body in addition to the turbulent boundary layer parameters. The formula has been applied successfully to lakes and reservoirs of areas ranging from a fraction of an acre to thousands of acres. It is also given in a simplified form for application to cases where the wind profile measurements are not made. (Knapp-USGS)
W72-08943

2E. Streamflow and Runoff

SEDIMENT TRANSPORT AND TURBIDITY IN THE EEL RIVER BASIN, CALIFORNIA,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02J.
W72-08504

LAND SURFACE FORM IN FLOOD HYDROLOGY,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
B. M. Reich.
In: Environmental Geomorphology, Proceedings of 1st Annual Geomorphology Symposia Series, held at Binghamton, N Y, Oct 16-17, 1970: State University of New York at Binghamton, Publica-

tions in Geomorphology, p 49-68, August 1971. 7 fig, 4 tab, 21 ref. FHA Contract FH-11-7429.

Descriptors: *Floods, *Hydrologic data, *Topography, *Pennsylvania, *Regional analysis, Rainfall-runoff relationships, Statistics, Peak discharge, Regional flood, Frequency analysis, Flood frequency.
Identifiers: *Flood regionalization.

Flood statistics from 102 Pennsylvania and neighboring watersheds were regionalized using 3 physiographic provinces. Analysis of variance was applied to six flood parameters. Multiple regressions against basin parameters were run in both the linear and log-transformed data. The most promising flood parameter is the 2.33 year peak in cubic feet per second adjusted to a 10 square mile watershed. Estimates for longer return periods can be made by applying only one ratio in all parts of the State. No clear improvement over the physiographic province division can be seen in this preliminary investigation. (See also W72-08510) (Knapp-USGS)
W72-08513

STREAMFLOW RECORDS OF THE SNOWY MOUNTAINS REGION, AUSTRALIA, 1966 TO 1970.
For primary bibliographic entry see Field 07C.
W72-08517

FLOW CHARACTERISTICS OF MINNESOTA STREAMS,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 07C.
W72-08519

SUMMARY OF ANNUAL WAVE POWER FOR TEN DEEP WATER STATIONS ALONG THE CALIFORNIA, OREGON AND WASHINGTON COASTS,
California Univ., Berkeley. Coll. of Engineering.
For primary bibliographic entry see Field 07C.
W72-08520

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR LITTLE POND CREEK AND NORTH ELM CREEK, BRAZOS RIVER BASIN, TEXAS, 1970,
Geological Survey, Austin, Tex.
R. M. Slade, Jr.
Geological Survey Open-file Report (Texas District), January 1972. 44 p, 2 fig, 2 tab, append.

Descriptors: *Hydrologic data, *Basic data collections, *Rainfall-runoff relationships, *Streamflow, *Texas, Stream gages, Rain gages, Storms, Discharge measurement, Flow rates, Small watersheds, Watershed management, Hydrographs, Mass curves.
Identifiers: *Brazos River Basin (Tex), *Little Pond Creek (Tex), *North Elm Creek (Tex).

Rainfall and runoff data collected during the 1970 water year are presented for the 22.2 sq-mi. area above the stream-gaging station Little Pond Creek at Burlington, Texas, and the 48.6 sq-mi. area above the stream-gaging station North Elm Creek near Cameron, Texas. The average rainfall during the 1970 water year on the Little Pond Creek study area was 32.50 inches, or approximately 4% below the average annual rainfall of 33.85 inches at Cameron (1931-60). The yearly mean discharge at the stream-gaging station at Burlington was 9.62 cfs, compared with the 8-year (1963-70) average of 11.5 cfs. The average rainfall on the North Elm Creek study area during the 1970 water year was 34.79 inches, or approximately 3% above the average annual rainfall of 33.85 inches at Cameron. The yearly mean discharge at the stream-gaging station near Cameron was 26.2 cfs, compared with the 8-year average (1963-70) of 22.5 cfs. Three storms were selected for detailed computations of time breakdown for rainfall and discharge. (Woodard-USGS)
W72-08524

SUPERCRITICAL FLOW IN CURVED CHANNELS--HYDRAULIC MODEL INVESTIGATION,
Army Engineer District, Los Angeles, Calif. Hydraulics Section.
For primary bibliographic entry see Field 08B.
W72-08526

FLOODS OF MAY 1968 IN SOUTH ARKANSAS,
Geological Survey, Washington, D.C.
R. C. Gilstrap.
Available from GPO, Washington, DC 20402 Price $1.00 paper cover Stock No 2401-1214. Geological Survey Water-Supply Paper 1970-A, 1972. 94 p, 23 fig, 1 plate, 6 tab, 16 ref.

Descriptors: *Floods, *Arkansas, *Flood damage, *Streamflow, *Lakes, Stream gages, Flow rates, Peak discharge, Runoff, Average flow. Data collections, Hydrologic data, Flood peak, Flood profiles, Rainfall-runoff relationships, Flow duration.

The floods of May 1968 in south Arkansas produced the greatest peak discharges in the history of recorded streamflow at several gaging stations. Most notable of these floods was on Cossatot River near DeQueen, which has a continuous record since 1938. The peak discharge of 122,000 cubic feet per second was almost twice the previous maximum discharge of 62,000 cubic feet per second in 1961. At Lake Greeson near Murfreesboro, water flowed over the spillway for the first time since construction of the dam in 1949. The lake reached an elevation of 564.60 feet, which is 1.60 feet above the spillway crest. The previous maximum stage of 557.84 feet occurred in 1953. No lives were lost as a result of the flood, but property damage amounted to about $18 million. Heavy rains began on May 7 and continued to May 18. The periods of heaviest rainfall were May 9-10, 13, and 16-17. The maximum 24-hour rainfall recorded was 10.1 inches at Gillham Dam near DeQueen on May 13. Flood data included were collected at 95 sites. (Woodard-USGS)
W72-08527

SPATIALLY VARIED OPEN-CHANNEL FLOW EQUATIONS,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 08B.
W72-08588

WATER RESOURCES INVESTIGATIONS IN MARYLAND AND THE DISTRICT OF COLUMBIA, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08732

WATER RESOURCES INVESTIGATIONS IN NEBRASKA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08733

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65: PART 4. ST. LAWRENCE RIVER BASIN--VOLUME 2. ST. LAWRENCE RIVER BASIN BELOW LAKE HURON.
Geological Survey, Washington, D.C.

Available from GPO Washington, DC 20402, $3.50. Geological Survey Water-Supply Paper 1912, 1971. 734 p, 1 fig, 1 plate.

Descriptors: *Basic data collections, *Surface waters, *Streamflow, *St. Lawrence River, Stream gages, Lakes, Reservoirs, Stage-discharge relations, Peak discharge, Low flow.
Identifiers: St. Lawrence River basin, Surface water records.

This report is one of a series of 37 reports presenting records of stage, discharge, and content, of streams, lakes, and reservoirs in the United States during the 1961-65 water years and covers the St. Lawrence River basin below Lake Huron. The data generally comprise a station description and a table showing daily discharge and monthly and yearly discharges. The station descriptions give the location, drainage area, records available, type and history of gages, average discharge, extremes of discharge, and general remarks. Type of gage currently in use and datum of the gage above mean sea level, and a condensed history of the types, locations, and datums of gages previously used during the record period are listed. Conditions affecting natural flow and information on accuracy of records are noted. Tables give daily, average, and extreme discharges and yearly totals and peak discharges. (Myers-USGS)
W72-08806

EXTENT AND FREQUENCY OF FLOODS ON CROSSWICKS CREEK FROM NEW EGYPT TO BORDENTOWN, N.J.,
Geological Survey, Trenton, N.J.
H. J. Freiberger, and T. G. Ross.
Geological Survey Open-file Report, March 1971. 36 p, 8 fig, 1 plate, 3 tab, 13 ref.

Descriptors: *Floods, *Flood plains, *Hydrologic data, *Flood profiles, *New Jersey, Flood control, Flood forecasting, Hydrographs, Maximum probable flood, Peak discharge.

Flooding along Crosswicks Creek from New Egypt to Bordentown, N. J., is described in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and text material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights, and other technical data. A stage-frequency curve represents a combination of tidal and (or) fluvial flooding at the mouth of Crosswicks Creek. Since the basin is sparsely populated, little information was available as to flood-crest elevations for past floods. The few historical flood elevations that were obtained are tabulated. The highest flood known on Crosswicks Creek upstream from head of tide is that of September 1938 when the creek at Groveville peaked at 17.9 feet. (Woodard-USGS)
W72-08816

A STOCHASTIC MODEL DESCRIBING THE WATER MOTION IN A RIVER,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Mathematics.
T. Kaijser.
Nordic Hydrology, Vol 2, No 4, p 243-265, 1971. 5 fig, 12 ref.

Descriptors: *Stochastic processes, *Statistical models, *Streamflow, *Open channel flow, Variability, Turbulent flow, Roughness (Hydraulic), Statistics, Time series analysis, Dispersion.
Identifiers: Stochastic hydrology.

A mathematical model is given for the movement of water particles in a river. Using the model it is possible to find an analytic expression for the distribution function of the transit time needed for a water particle to travel from one cross section of the river to another. This implies a quantitative description of the longitudinal dispersion in the river. The river is divided into two layers, an upper layer and a lower layer. The border-line between the two layers will depend on the mean velocity of the river and on the velocity profile across the river. The longitudinal velocity is constant and positive in the upper layer and zero in the lower layer. A water particle moves back and forth between the two layers in a random way. The probability law governing this movement will depend on a parameter characterizing the roughness of the bottom of the river. (Knapp-USGS)
W72-08819

STOCHASTICITY IN GEOPHYSICAL AND HYDROLOGICAL TIME SERIES,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 02A.
W72-08820

DERIVATION OF HYDROLOGIC FREQUENCY CURVES,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 02A.
W72-08951

WATER RESOURCES INVESTIGATIONS IN ILLINOIS, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08992

WATER RESOURCES INVESTIGATIONS IN INDIANA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08993

WATER RESOURCES INVESTIGATIONS IN CALIFORNIA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08994

WATER RESOURCES INVESTIGATIONS IN CONNECTICUT, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08995

ANALYSIS OF WATER LEVEL DATA FOR EVERGLADES NATIONAL PARK, FLORIDA,
Geological Survey, Tallahassee, Fla.
T. J. Buchanan, and J. H. Hartwell.
Geological Survey Open-file Report 72004, 1972. 30 p, 12 fig, 1 tab, 8 ref.

Descriptors: *Water levels, *Gaging stations, *Hydrologic data, *National parks, *Florida, Data collections, Surface waters, Water level fluctuations, Duration curves, Recession curves, Rainfall, Seasonal, Swamps.
Identifiers: *Everglades National Park, Historical data.

Stage-duration curves were developed from data collected 1953-69 at five gaging stations in Everglades National Park, Florida. Four of the five curves show similar characteristics with an increase in the slope when the water level is below land surface. Monthly stage-duration curves, developed for one of the stations, reflect the seasonal trends of the water level. Recession curves were prepared for the same five stations. These curves represent the average water-level decline during periods of little or no rainfall, and the decline in level is shown at the end of 10, 30, and 60 days for any given initial stage. A family of curves was also prepared to give the recession from various initial stages for any period up to 60 days. (Woodard-USGS)
W72-09001

CHECKS ON THE WATER BALANCE OF A SMALL CATCHMENT,
Hull Univ. (England).
For primary bibliographic entry see Field 02A.
W72-09005

EXPERIMENT IN THE MATHEMATICAL DESCRIPTION OF THE FORM OF LONGITUDINAL RIVER PROFILES,
Kazan State Univ. (USSR).
G. P. Butakov.
Geomorphology, No 4, p 336-340, October-December 1970. 4 fig, 11 ref. (Translated from Geomorfologiya, No 4, p 74-79, October-December 1970).

Descriptors: *Channel morphology, *Rivers, *Mathematical studies, *Equations, Geomorphology, Topography, Hydrology, Headwaters, Upstream.
Identifiers: *USSR, *Volga River, Paleogeomorphology, Paleohydrography, Tectonics.

A study was made of longitudinal profiles of rivers in the Middle Volga region for paleogeomorphological reconstructions of the ancient relief of the area. Comparison of the different equations used in approximating the longitudinal river profiles revealed that the form of the topographic profile is best represented by a logarithmic equation. All other equations (parabolic, exponential, and log-log) do not reflect the form of the real river profile, and computations are frequently time consuming. Parameters of the logarithmic equation can be determined even if the specific profile of an ancient watercourse is unknown. This is particularly important when the equation is used in the reconstruction of a paleohydrographic network. (Josefson-USGS)
W72-09010

FLOW AND CHANNEL DYNAMICS OF RIVERS IN NONTIDAL DELTA REACHES (DINAMIKA POTOKA I RUSLA V NEPRILIVNYKH UST-'YAKH REK),
State Oceanographic Inst., Moscow (USSR).
For primary bibliographic entry see Field 02L.
W72-09012

2F. Groundwater

WATER RESOURCES OF DORCHESTER AND TALBOT COUNTIES, MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 04B.
W72-08500

GROUND-WATER CONDITIONS DURING 1970 IN INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W72-08505

GEOLOGY AND GROUND-WATER SYSTEM IN THE GILA RIVER PHREATOPH'TE PROJECT AREA, GRAHAM COUNTY, ARIZONA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 03B.
W72-08509

THE RESPONSE TO TIDAL FLUCTUATIONS OF TWO NON-HOMOGENEOUS COASTAL AQUIFER MODELS,
Hawaii Univ., Honolulu. Water Resources Research Center.
J. A. Williams, and Liu Ta-Chiang.
Available from the National Technical Information Service as PB-209 517. Technical Report No 51, September 1971. 70 p, 23 fig, 3 tab, 7 ref, 2 append. OWRR A-020-HI (1).

Descriptors: Groundwater movement, Coasts, Aquifers, *Tidal effects, *Model studies, *Analog models, Mathematical models.
Identifiers: *Coastal aquifer models.

Mathematical and electric analog (R-C circuit) models for two one-dimensional non-homogeneous coastal aquifers have been developed. The first is a semi-infinite aquifer having a discontinuous change in permeability at a known distance from the coastline and the second is an aquifer whose permeability changes linearly with distance from the coastline and whose interior boundary represents either a constant head or a no-flow condition. Both models were subjected to a sinusoidal tidal input. Results, in the form of graphs of amplitude and phase angle vs. position, show excellent agreement between the outputs of the mathematical and electric analog models. In the case of a discontinuous permeability, these graphs indicate a positive or negative reflection from the discontinuity for a decrease or increase, respectively, in the permeability. In the case of the linearly varying permeability model, the graphs of amplitude indicate that energy is attenuated at a greater rate near the coastline when both types of boundary condition are less than one. Graphs of the phase angle are concave downwards for the constant-head boundary condition.
W72-08585

THE CHEMICAL EXCHANGE CAPABILITIES OF THE BATON ROUGE GROUND-WATER SYSTEM,
Louisiana Water Resources Research Inst., Baton Rouge.
For primary bibliographic entry see Field 02K.
W72-08589

DEEP SEEPAGE ON PIEDMONT WATERSHEDS,
Clemson Univ., S. C. Water Resources Research Inst.
J. T. Ligon, and T. V. Wilson.
Available from the National Technical Information Service as PB-209 534, $3.00 in paper copy, $0.95 in microfiche. South Carolina Water Resources Research Institute Report No. 29, April 1972. 66 p, 31 fig, 6 tab, 5 ref. OWRR A-014-SC (3).

Descriptors: *Groundwater movement, *Soil moisture, Water table, Percolation, Root zone, Subsurface flow, *South Carolina.
Identifiers: *Piedmont watersheds (SC).

The objectives were (1) to determine the principal factors affecting deep seepage in the Piedmont, and (2) to develop relationships to express percolation in terms of measurable physical quantities. A field experiment was conducted which included measurements of precipitation, surface runoff, interflow, soil moisture to a depth of 32 feet, and water table levels. The high-clay content, B2t horizon was found to act as a restricting layer for deep seepage. However, considerable quantities of deep seepage occur principally during the winter and early spring when precipitation is normally heavy and evapotranspiration low. Time lags, between the occurrence of excess moisture near the soil surface and a resulting effect on the water table, varied from 5 1/2 months for an initially low-moisture profile, down to only 4 weeks for an initially high-moisture profile. An empirical model for predicting deep seepage was developed and tested and a stochastic model of soil moisture in the profile is under development. Graphs are presented showing measured soil moisture profiles at different times under both wetting and draining conditions. Graphs and tables also show moisture excess predicted by the empirical model, and the predicted water table hydrograph compared to that observed.
W72-08590

AQUIFER PERFORMANCE TESTS UNDER TWO-PHASE FLOW CONDITIONS,
Alabama Univ., University. Natural Resources Center.
H. R. Henry, J. R. McDonald, and R. M. Alverson.
Available from the National Technical Information Service as PB-209 535, $3.00 in paper copy, $0.95 in microfiche. Natural Resources Center of University of Alabama and Geological Survey of Alabama Final Report, March 1971. 117 p, 74 fig, 4 tab, 25 ref, 2 append. OWRR B-020-ALA (1).

Descriptors: Water wells, *Groundwater movement, *Aquifer systems, *Aquifer testing, *Underground waste disposal, *Injection wells, *Waste disposal wells, *Dispersion, *Heat transfer, *Thermal pollution, Model studies.
Identifiers: *Two-phase flow, *Discharge well, Well field, *Well-aquifer system.

Laboratory models offer an excellent method of studying dispersion of pollution, especially thermal pollution, from injection wells. Lines of constant temperature have essentially the same shape as the streamline dividing the flow originating in the injection well from that in the discharge well. Pollution spreads considerably beyond limits of this dividing streamline. Differential equations are given for heat dispersion from an injection source in a saturated aquifer. Experimental data verify that piezometric profiles would not change with temperature of the injected water substantiating the theory that subsurface formations can absorb and dissipate large amounts of heat. (Warman-Alabama)
W72-08591

WATER RESOURCES INVESTIGATIONS IN MARYLAND AND THE DISTRICT OF COLUMBIA, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08732

WATER RESOURCES INVESTIGATIONS IN NEBRASKA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08733

AFTERSHOCKS CAUSED BY PORE FLUID FLOW,
Stanford Univ., Calif. Dept. of Geophysics.
For primary bibliographic entry see Field 08E.
W72-08812

MECHANISM OF GROUNDWATER RESERVOIRS,
Technical Univ. of Denmark, Copenhagen. Inst. of Hydrodynamics and Hydraulic Engineering.
J. Eliasson.
Nordic Hydrology, Vol 2, No 4, p 266-277, 1971. 3 fig, 1 tab.

Descriptors: *Groundwater movement, *Aquifer characteristics, *Water yield, *Unsteady flow, *Mathematical models, Water balance, Infiltration, Model studies, Linear programming, Unit hydrographs, Water level fluctuations, Fourier analysis.
Identifiers: Iceland.

A groundwater reservoir with time-independent boundary conditions is characterized by an average groundwater table, and variations can be treated as departures from this average value. The average groundwater table can be found if the storage coefficient S, the coefficient of transmissibility T, and the average infiltrations are known, together with the boundary values. The reservoir responds to variations in the infiltration as a series of many parallel linear reservoirs. The major proportion of the water goes through the first reservoirs, and these have the largest time constant, so the flow is mainly characterized by these reservoirs. The output characteristics are functions of the ratio of the time constant of the reservoir and the input period under consideration. The character of the reservoir can be accurately judged from the time constant of the largest (first) linear reservoir. In a large reservoir, variations in the runoff discharge are small and 1/4 of a cycle behind the infiltration. (Knapp-USGS)
W72-08818

THE ROLE OF GRAVITY IN CAPILLARY PRESSURE MEASUREMENTS,
Calgon Corp., Pittsburgh, Pa.
M. T. Szabo.
Society of Petroleum Engineers Journal, Vol 12, No 2, p 85-88, April 1972. 4 fig, 4 ref.

Descriptors: *Capillary action, *Permeability, *Laboratory tests, Porous media, Capillary conductivity, Analytical techniques, Instrumentation, Porosity, Capillary water, Groundwater, Pore pressure, Saturated flow, Unsaturated flow.
Identifiers: Capillary pressure.

Saturation profiles are influenced by gravity during the measurement of capillary pressures in porous samples. A precise method is suggested for calculating realistic capillary pressure curves from the data obtained in either the 'diaphragm' or the 'gravity drainage of long vertical core' method. A capillary pressure curve, free of the influence of gravity, can be determined from measurement of the pressures applied in the nonwetting phase and from the average saturations corresponding to capillary equilibria. The same equations may also be used for the evaluation of centrifuge data, provided the increase in capillary pressures is achieved by gradual lengthening of end-effect absorbers set up under the test sample, using the same constant speed of rotation at each run. (Knapp-USGS)
W72-08944

DEEP PERCOLATION IN A SAND HILL AREA,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R. E. Glover.
Water Resources Bulletin, Vol 8, No 2, p 399-400, April 1972. 6 ref.

Descriptors: *Percolation, *Recharge, *Infiltration, *Water balance, *Surface-groundwater relationships, Nebraska, Great Plains, Water yield, Sands.
Identifiers: *Sand Hills (Nebr), Ogallala Formation.

Infiltration into the Ogallala aquifer in Nebraska was calculated using records for two rivers flowing in a Sand Hill area. The infiltration is 0.23 feet per year, which is 13% of the precipitation. Weather Bureau records for Halsey based on 58 years of observation yield an average precipitation rate of 20.73 inches per year or 1.727 feet per year. In this area the deep percolation represents 0.134 of the precipitation. (Knapp-USGS)
W72-08946

STREAM DEPLETION BY WELLS IN THE SOUTH PLATTE BASIN--COLORADO,
Colorado Div. of Water Resources, Denver.
For primary bibliographic entry see Field 04B.
W72-08947

NONSTEADY FLOW TO A WELL WITH TIME DEPENDENT DRAWDOWN,
Wisconsin Univ., Milwaukee. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04B.
W72-08949

WHAT DO WE KNOW ABOUT SALT WATER INTRUSION,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W72-08950

WATER RESOURCES INVESTIGATIONS IN ILLINOIS, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08992

WATER RESOURCES INVESTIGATIONS IN INDIANA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08993

WATER RESOURCES INVESTIGATIONS IN CALIFORNIA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08994

WATER RESOURCES INVESTIGATIONS IN CONNECTICUT, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08995

SNOW AND ICE MELT AS INDICATORS OF HYDROLOGIC CONDITIONS, EXPLORATORY STUDY,
South Dakota State Univ., Brookings. Remote Sensing Inst.
L. R. Heinemann, V. I. Myers, and D. G. Moore.

Descriptors: *Groundwater movement, *Remote sensing, *Aquifers, *Snowmelt, *South Dakota, Ice, Melt water, Temperature, Heat transfer, Soils, Soil moisture, Aircraft, Aerial photography, Mapping, Analytical techniques, Evaluation, Aquifer characteristics.
Identifiers: *Imagery.

The use of snow and ice melt was investigated as indirect indicators of groundwater occurrence and movement in South Dakota. Direct measurements of the distribution of water in nature are timely, costly, and only feasible for limited areas in South Dakota. Aquifers can seldom be detected directly by using remote sensing, however, snow and ice-melt patterns are two of the features appearing on imagery that aid in identifying aquifers. A shallow aquifer forms a heat sink that modifies the volumetric heat capacity of the earth's crust and influences the temperature at the land surface. Snow and ice melt patterns can be a surface expression of subsurface characteristics. Using a heat sink concept, the imagery provided information aiding in: (1) the delineation of shallow aquifers in glacial drift, and (2) the location of groundwater movement into rivers. The interpretation of snow and ice-melt anomalies in combination with other remotely sensed data will strengthen capabilities in groundwater mapping. (Woodard-USGS)
W72-08999

HYDROGEOLOGY OF THE USSR, VOL 13: THE VOLGA-KAMA RIVER REGION (GIDROGEOLOGIYA SSSR. TOM XIII. POVOLZH'YE I PRIKAM'YE).

Izdatel'stvo 'Nedra', Moscow, 1970. 800 p.

Descriptors: *Hydrogeology, *Areal hydrogeology, *Engineering geology, *Groundwater, Groundwater basins, Aquifers, Stratigraphy, Geologic formations, Geologic time, Geologic investigations, Geologic mapping, Geomorphology, Karst, Landslides, Water types, Water quality, Water chemistry, Geothermal studies, Natural resources, History.
Identifiers: *USSR, *Volga River, *Kama River, *Artesian basins, *Tectonics, Mineralization, Regionalization.

This volume in the series 'Hydrogeology of the USSR' is devoted to a study of hydrogeological conditions in the Volga-Kama River region, which covers an area of 976,300 sq km and includes the Astrakhan, Volgograd, Gorkiy, Ivanovo, Kirov, Kostroma, Kuybyshev, Penza, Saratov, Ul'yanovsk Oblasts, part of the Rostov Oblast, and the Kalmyk, Mari, Mordovian, Tatar, Udmurt, and Chuvash Autonomous Republics. Emphasis is placed on formation, distribution, and hydrochemical and hydrothermal zonality of

groundwaters; classification and mapping of mineral and industrial waters; and on a hydrogeological division of the region into 8 artesian basins according to geological structure and the character and distribution of aquifers. The hydrogeology of oil, gas, and mineral deposits is presented together with an engineering-geological regionalization of the area and a description of present-day geological and engineering-geological processes and phenomena. (Josefson-USGS)
W72-09006

HYDROGEOLOGY OF THE FROZEN ZONE OF THE LITHOSPHERE (OSOBENNOSTI GIDROGEOLOGII MERZLOY ZONY LITOSFERRY),
For primary bibliographic entry see Field 02C.
W72-09007

MATERIALS ON HYDROGEOLOGY AND THE GEOLOGICAL ROLE OF GROUNDWATER (MATERIALY PO GIDROGEOLOGII I GEOLOGICHESKOV ROLI PODZEMNYKH VOD).
Leningrad State Univ. (USSR).

Izdatel'stvo Leningradskogo Universiteta, Leningrad, Khod'kov, A. Ye., editor, 1971. 280 p.

Descriptors: *Hydrogeology, *Groundwater, *Groundwater basins, *Water chemistry, *Geochemistry, Stratigraphy, Petrology, Mineralogy, Mining, Salts, Potassium compounds, Trace elements, Brines, Pore water, Weathering, Karst, Volcanoes, Geologic time, Geologic mapping, Methodology.
Identifiers: *USSR, *Ukraine, *Halogenic deposits, *Ores, Supergene, Mineralization.

This three-part monograph contains 35 papers on hydrogeology, hydrochemistry, and hydrogeologic methodology and field practice. Parts I and II deal with the formation and geological role of groundwaters of halogenic deposits, including a study of the hydrogeological conditions of exploitable salts deposits of the USSR in general (6 papers) and of the Stebnik potassium salt deposit in the L'vov Oblast of the Ukraine in particular (14 papers). Problems of general hydrogeology and techniques of hydrogeological and hydrochemical investigations are discussed in the 15 papers of the concluding part. (Josefson-USGS)
W72-09013

2G. Water in Soils

ANALYSIS OF EARTH RESOURCES IN THE PHOENIX, ARIZONA, AREA,
California Univ., Berkeley. Forestry Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W72-08492

THE OCCURRENCE OF ALKANES IN FULVIC ACID, A SOIL HUMIC FRACTION,
Department of Agriculture, Ottawa, (Ontario). Soil Research Inst.
G. Ogner, and M. Schnitzer.
Geochimica et Cosmochimica Acta, Vol 34, No 8, p 921-928, 1970. 4 fig, 1 tab, 11 ref.

Descriptors: *Soil chemistry, *Water chemistry, *Organic matter, *Solubility, *Humic acids, Soils, Chemical reactions, Organic compounds, Separation techniques, Methodology, Soil water.
Identifiers: *Alkanes, *Fulvic acid, Research projects.

Humic compounds constitute the bulk of the organic matter in soils and possibly also in waters, yet little is known about their chemical structure. The chemical composition of a water-soluble fulvic acid (FA), a low-molecular weight humic material, was examined in the isolation of alkanes from the FA. Normal plus branched-cyclic alkanes were found to account for a maximal 0.16% of the weight of a water-soluble soil fulvic acid. Only 3% of the total alkanes could be extracted by hexane, benzene and ethyl acetate from untreated solid fulvic acid. N-heptane extracted approximately 12% of the total alkanes from a solution of fulvic acid in methanol, and also from a suspension of untreated soil in methanol. Most of the alkanes were extractable only after methylation of the fulvic acid and adsorption on aluminum oxide. Reduction of hydrogen bonding by methylation appeared to be related to the release of alkanes by the fulvic acid. (Woodard-USGS)
W72-08502

EFFECTS OF WATER TABLE HEIGHT ON SOIL AERATION AND CROP RESPONSE,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W72-08521

RELIABILITY OF SALINITY SENSORS FOR THE MANAGEMENT OF SOIL SALINITY,
Agricultural Research Service, Riverside, Calif. Soil and Water Conservation Research Div.
J. D. Oster, and L. S. Willardson.
Agron J. 63 (5): 695-698. 1971.
Identifiers: California, Conductivity, Electrical, Infiltration, Instrumentation, Irrigation, Management, Salinity, Sensors, Soil, Surface, Topography.

Laboratory-constructed and commercial salinity sensors were evaluated for stability of calibration and accuracy of measurement of soil salinity. Of the commercial sensors 85% were stable and performed satisfactorily for at least 1.5 yr with an estimated accuracy of PLUS OR MINUS 0.6 mmho cm-1. Laboratory-constructed sensors were accurate to PLUS OR MINUS 1 mmho cm-1. Commercial sensors were used to monitor soil salinity in a field in the Imperial Valley, California, demonstrating their value for salinity control. The salinity data revealed differences in water infiltration caused by surface topography and the disturbance of soil during the installation of the sensor.--Copyright 1972, Biological Abstracts, Inc.
W72-08522

THE LAND (1): ITS FUTURE-ENDANGERING POLLUTANTS,
For primary bibliographic entry see Field 05B.
W72-08538

EFFECT OF BURULLUS LAKE BRACKISH WATER ON THE DISTRIBUTION OF SALTS AND ON THE SOIL PROFILE FORMATION IN SOILS ADJACENT TO THE LAKE,
Ministry of Agriculture, Cairo (Egypt). Soils Dept.
F. A. F. El-Bogdady, R. M. Abd Elaal, and S. N. Ismail.
Agr Res Rev (Cairo). 47 (1): 59-80. Illus. 1969.
Identifiers: Brackish, Burullus, Distribution, Formation, Lake, Profile, Reclamation, Salts, Soil, Soils, Water.

These soils are influenced by the tide generated by the northern lakes and the Mediterranean Sea. Special consideration for their high salinity and high groundwater table level when planning for their reclamation and improvement is necessary. Fourteen profiles were examined to the depth of about 100-150 cm up to the groundwater level. The soil is very heavy textured with high-clay content, ranging in the top layers from 32.5 to 73.5% with an average of 52.89%. The heavy soil texture has its bad effect on drainage efficiency. CaCO3 is present with an average of 1.54% in the top layers and about 0.1% in the deep subsoil. The organic matter content averages about 1.54% in the top soil decreasing with depth. The average content increases at layers approaching the groundwater level. The soil salinity in the different profiles varies widely with their distance from the lake. Na present in the form of common salt is the prevailing cation. The groundwater salinity also varies greatly in the different localities.--Copyright 1972, Biological Abstracts, Inc.
W72-08571

DEEP SEEPAGE ON PIEDMONT WATERSHEDS,
Clemson Univ., S. C. Water Resources Research Inst.
For primary bibliographic entry see Field 02F.
W72-08590

WATER REGIME OF SOIL IN RELATION TO THE USE OF HERBICIDES, (IN RUSSIAN),
V. S. Volodin.
Nauchn Tr Kursk Gos S-kh Opty Stn. 4 : 179-184. 1969.
Identifiers: Atrazine, Corn-M,D-Moisture, Herbicides, Regime, Relation, Reserves, Simazine, Soil.

Appreciable improvement occurred in the water regime of chernozem soil in corn fields that were treated with simazine and atrazine. The moisture reserves increased in a field treated with 2, 4-D, but decreased slightly in a field treated with triazine derivatives.--Copyright 1971, Biological Abstracts, Inc.
W72-08622

CALCULATION FROM SOIL PROPERTIES OF WILTING HUMIDITY, (IN CZECH),
Research Inst. of Irrigation Farming, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 03F.
W72-08649

VEGETATION PRODUCTIVITY VARIATION IN CONNECTION WITH HYDROTHERMAL CONDITIONS (IN RUSSIAN),
Akademiya Nauk Azerbaidzhanskoi SSR, Baku. Institut Pochvovedeniya i Agrokhimii.
For primary bibliographic entry see Field 02I.
W72-08734

LEGUMINOUS COVER CROPS FOR MAINTAINING SOIL FERTILITY IN SISAL IN TANZANIA: II. EFFECTS ON MOISTURE STATUS OF SOIL AND SISAL,
Ministry of Agriculture, Dar es Salaam (Tanzania). Research Div.
D. Hopkinson.
Exp Agric. Vol 7, No 4, p 337-343, 1971, Illus.
Identifiers: *Cover crops, Fertility, *Soil moisture, Pueraria Phaseoloides D, Sisal-M, Tanzania, *Soil-water-plant relationships.

The effect of covers of controlled volunteer vegetation, Pueraria phaseoloides, and clean weeding on the soil moisture content and on the succulence of sisal leaves was studied. The surface soil tended to dry out further when exposed by clean weeding, but moisture in the profile as a whole was not much depleted. The plant covers dried soils to at least 300 cm. in dry periods. Although sisal leaves had a slightly higher dry matter content in dry weather there was no evidence of competition for water between the plant covers and the sisal.--Copyright 1972, Biological Abstracts, Inc.
W72-08773

A STUDY OF THE EFFECT OF SOIL COMPACTION AND MOISTURE REGIMES ON THE GROWTH AND CHEMICAL COMPOSITION OF MAIZE PLANTS,
Punjab Agricultural Univ., Hissar (India). Dept. of Soils.
For primary bibliographic entry see Field 03F.
W72-08775

THE EFFECT OF MOISTURE ON SLOPE STABILITY: A CLASSIC EXAMPLE FROM SOUTHERN ALBERTA, CANADA,
Lethbridge Univ. (Alberta). Dept. of Geography.
For primary bibliographic entry see Field 02J.
W72-08811

LIST AND LOCATION OF SNOW COURSES AND SOIL MOISTURE STATIONS.
Colorado Agricultural Experiment Station, Fort Collins.
For primary bibliographic entry see Field 02C.
W72-08814

SOILS ALONG THE ARAKS RIVER AND THEIR RATIONAL USE,
S. G. Gasanov.
Akademiya Nauk Azerb. SSR: Baku. 1969. 196p.
Identifiers: Araks, Classification, Genesis, Pedological, Physicochemical, Rational, River, Soils, USSR, Zoning.

The monograph is the result of comprehensive soil investigations carried out in 1955-1961. The genesis of chestnut humus-sulfate soils, solodization, distribution of the genetic types of deposits and the weathering crust are described in detail. The physicochemical properties of the principal soils on the Araks piedmont plain are briefly described. The classification of soils of the territory, the agricultural-pedological zoning and descriptions of the different soil districts are given.--Copyright 1971, Biological Abstracts, Inc.
W72-08838

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, HARDING COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-08876

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, EDDY COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-08877

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, LUNA COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-08878

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, HIDALGO COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-08879

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, LEA COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-08880

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, DONA AND COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-08881

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, SANTA FE COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-08882

THERMODYNAMICS OF SOIL WATER: I. THE ENERGY CONCEPT OF SOIL WATER,
National Inst. of Agricultural Science, Tokyo (Japan).
S. Iwata.
Soil Science, Vol. 113, No. 3, p. 162-166, 1972. 4 ref.

Descriptors: *Chemical potential, *Water chemistry, *Soil moisture, *Thermodynamic behavior, *Theoretical analysis, Temperature, Solutes, Surfaces, Pressure, Physicochemical properties.
Identifiers: *Soil water potential.

The state of water in soil may be grasped only by the use of the chemical potential concept. The chemical potential is precisely defined under potential fields and the thermodynamic state variables of water in soil are enumerated and discussed. Definitions are obtained for a uniform electric field and conservative force field. When the conservative force field acts on water in soil, the potential energy of the interaction is inversely proportional to the solid surface. The condition of equilibrium is obtained for a heterogeneous system placed in a nonuniform electric field and/or a conservative force field. Hietherto, chemical potential of soil water has been expressed as a function of soil water content, temperature and pressure. It is felt that other thermodynamic quantities influence soil water chemical potential but have been neglected because water in the soil has been dealt with as a homogeneous system. The variables needed to determine the state of water in soil are: (1) pore radius, which is governed by the soil particle arrangement; (2) species and concentration of solute in the system; (3) surface density of the electric charge; (4) distance from particle surface; (5) temperature; (6) external pressure; (7) water content. (Casey-Arizona)
W72-08885

PREDICTION OF EXCHANGEABLE SODIUM PERCENTAGE FROM CATION EXCHANGE EQUILIBRIA,
Udaipur Univ. (India).
K. V. Paliwal, and G. L. Maliwal.
Geoderma, Vol. 6, No. 1, p. 75-78, 1971. 1 fig, 1 tab, 9 ref.

Descriptors: *Saline soils, *Cation exchange, *Alkalie soils, *Correlation analysis, Estimating equations, Sodium, Cation adsorption, Soil chemical properties, Soil water.
Identifiers: *Exchangeable sodium percentage, *Sodium adsorption ratio, *Cation exchange capacity.

In an attempt to find the best predictor of exchangeable sodium percentage (ESP) on the basis of sodium adsorption ratio (SAR), various saline or alkali soils were tested. Gapon's equation was of practical value, while equations developed by the U. S. Salinity Laboratory staff and by Bower showed significant correlations between SAR and ESP. Bower's equation was somewhat more accurate. Because equations based on cation exchange equilibria fit better, the relationship between ESP and SAR was found from ion exchange equilibria consisting of Na-Ca-Mg ions which are the dominant cations generally present in saline-sodic soils. The equation derived was highly accurate and it was felt that since it was derived on the basis of soils showing wide variation in texture and mineralogical composition, it may find wide application in ESP studies. The inaccuracy of earlier equations such as Gapon's is increased by increasing soil alkalinities. (Casey-Arizona)
W72-08886

IRRIGATION REGIMES IN A SEMI-ARID AREA AND THEIR EFFECTS ON GRAPEFRUIT YIELD, WATER USE AND SOIL SALINITY,
Volcani Inst. of Agricultural Research, Rehovot (Israel) and Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 03F.
W72-08888

BORON ADSORPTION BY SOILS AS INFLUENCED BY POTASSIUM,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel); and Technion - Israel Inst. of Tech., Haifa.
A. Hadas, and J. Hagin.
Soil Science, Vol. 113, No. 3, p 189-193, 1972. 3 fig, 2 tab, 13 ref.

Descriptors: *Cation adsorption, *Boron, *Potassium, *Soil investigations, Soil types.
Identifiers: *Langmuir adsorption isotherm.

At high soil boron levels, K increases boron uptake and boron toxicity symptoms, and at low soil boron levels, K exacerbates boron deficiencies. This study compares the extent of boron adsorption by K-saturated and untreated soils. Boron adsorption was larger and stronger in the K-saturated soils for the entire boron concentration range in the experiments. Despite the relatively great strength of adsorption, boron desorbed easily from the K-saturated soils, showing that adsorption was reversible. At very low boron concentrations the adsorption was smaller but stronger. It appears that the boron adsorption is directly related to the K rather than indirectly related to Ca deficiencies as was formerly thought. Probably the effect of K is to create more favorable conditions for boron adsorption in the soil. (Casey-Arizona)
W72-08890

SOIL WATER MOVEMENT TO GERMINATING SEEDS,
Volcani Inst. of Agricultural Research, Rehovoth (Israel).
S. Dasberg.
Journal of Experimental Botany, Vol. 22, No. 73, p 999-1008, November 1971. 4 fig, 1 tab, 9 ref.

Descriptors: *Seeds, *Soil water movement, *Germination, *Gamma rays, *Soil types, Laboratory tests, Theoretical analysis, Plant growth, Hydraulic conductivity, Plant root systems, Water requirements, Soil-water-plant relationships.
Identifiers: *Seedlings, *Soil water potential.

Using the gamma-ray technique, the movement of soil water to layers of seeds of several range plants was measured and calculations of water movement to a single seed or to a layer of seeds were carried out for comparison. Seeds were placed at a depth of 1.5 cm in soil of several water contents. The soil water content of 3 mm layers above and below the seeds was measured daily. The distance from which water was taken up the seed was not affected by the initial soil water content, according to the soil water measurements. This could not be found from the theoretical analysis because of the lack of knowledge of the seed water potential. It can be assumed that the differences in potential gradients were compensated by the drop in hydraulic conductivity of the soil at lower water contents, resulting in net movement of water to the seed from roughly the same distances. It may be concluded that seed germination is dependent on seed water uptake, which is determined by the soil water status. The initial growth rate of the seedling roots seems to be less influenced by the soil water content than is the growth rate of the shoots. (Casey-Arizona)
W72-08895

SOIL WATER EVAPORATION,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 02D.
W72-08933

A HYDRAULIC MODEL FOR THE SIMULATION OF NON-HYSTERETIC VERTICAL UNSATURATED FLOW OF MOISTURE IN SOILS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
G. P. Wind.
Journal of Hydrology, Vol 15, No 3, p 227-246, March 1972. 11 fig, 1 tab, 5 ref.

Descriptors: *Unsaturated flow, *Hydraulic models, *Infiltration, Drainage, Seepage, Soil-water movement, Model studies, Unsteady flow, Hydraulic conductivity, Capillary conductivity, Saturated flow, Hysteresis.

A hydraulic model used to simulate infiltration and drainage processes in soils of low permeability was built. It consists of a number of vessels, each simulating a layer of soil with its moisture characteristic, connected by a number of tubes, simulating capillary conductivity. The model reacts in nearly the same manner as the soil would, according to knowledge of the flow processes and parameters. The model can be used to study non-steady state infiltration and drainage processes. (Knapp-USGS)
W72-08942

DEEP PERCOLATION IN A SAND HILL AREA,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W72-08946

EFFECT OF HUMIDITY ON THE CARBON MINERALIZATION IN VOLCANIC SOILS OF COSTA RICA, (IN SPANISH),
Inter-American Inst. of Agricultural Sciences, Turrialba (Costa Rica).
Mario Blasco.
Turrialba. 21 (1): 7-12. 1971. English summary.
Identifiers: Carbon, Costa Rica, Di, Humidity, Microbial, Mineralization, Oxide, Production, Soils, Volcanic.

Soils derived from volcanic ashes (basaltic-andesitic materials from the Irazu and Turrialba volcanoes) used in this study are located on the slopes of the Cordillera Central and the Meseta Central. The CO2 evolution during incubation occurred at all moisture tensions studied. The highest CO2 production was reached at 0.3 bars, while the lowest evolution corresponded to waterlogged conditions. The rate of CO2 evolution was greater in soils covered with recent ashes, this probably being due to the presence of fresh organic materials which do not form complexes with allophane that are as stable as in older volcanic profiles. The C-mineralization was higher during the 1st 3-wk period of incubation. The microbial population appeared to be active.--Copyright 1971, Biological Abstracts, Inc.
W72-08956

SOIL AND LEAF NUTRITIONAL STATUS OF COCOA PLANTINGS ON THE EAST AND WEST COASTS OF MALAYA,
Rubber Research Inst. of Malaya, Kuala Lumpur (Malaysia).
Ng Siew Kee, S. Eng Thamboo, and Cheah Thean Eng.
Malaysian Agr J. 47 (4): 390-408. 1970. Illus.
Identifiers: Acidity, Availability, Base, Capacity, Cation, Coasts, Cocoa-D, Coconut-M, Dieback, East, Exchange, Incidence, Leaf, Malaya, Moisture, Nutritional, Plantings, Saturation, Soil, Stress, West.

The study was conducted on contrasting soils in 2 localities to ascertain soil and nutritional factors that might be responsible for the better growth and lower incidence of dieback of Amelonado and Upper Amazon cocoa on the west coast. The better area had higher cation exchange capacity, base saturation and exchangeable bases with Mg predomination. However, no differences in pH, N and P contents were found. In an experimental area on granitic soil, 10 tons/acre of limestone increased pH by about 1 1/2 units to 6.3-6.4 in the 1st 18 in. of soil. There was considerable variation in leaf nutrient contents over the 2-yr period, especially in the case of Ca. N levels were higher in the east coast areas but Mg levels were lower. P, K and Mg appeared to be in adequate supply in all areas. Ca levels tended to be greater in the west coast plantings but overall, levels were considered insufficient. Mg, Co and N contents were higher in the west coast but no shortage of micronutrients was indicated. Al content did not seem excessive. The poorer performance of plantings on granitic soils of the east coast may be due to an environmental complex in the root region, involving high soil acidity, low base saturation and exchangeable Ca, but high Al in the exchange complex, inhibition by Al of Ca and water uptake by cocoa roots, as well as seasonal moisture stress during drier parts of the year. However, these conditions were most probably associated with environmental and physiological factors such as light intensity and moisture availability. There is good prospect of expansion of cocoa planting under coconuts on marine clay soils.--Copyright 197i, Biological Abstracts, Inc.
W72-08988

CLAY WATER DIAGENESIS DURING BURIAL: HOW MUD BECOMES GNEISS,
Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
C. E. Weaver, K. C. Beck, and C. O. Pollard, Jr.
Geological Society of America Special Paper 134, 1971. 96 p, 27 fig, 9 tab, 118 ref. OWRR A-008-GA (4). NSF Grant GA-1330.

Descriptors: *Diagenesis, *Muds, *Clays, *Shales, *Clay minerals, Mineralogy, Water chemistry, Sedimentation, Kaolinite, Montmorillonite, Illite, Beidellite, Ion exchange, Ion transport, Connate water.

Diagenesis of muds was studied by analyzing samples from 4,233 ft to 16,450 ft deep in the Gulf of Mexico and from the surface to 24,003 ft in the Anadarko Basin, Oklahoma. With depth montmorillonite is altered to mixed-layer illite-chlorite-montmorillonite; the regularity of the mixed-layer phase tends to increase with depth. Much of the interlayer hydroxy material is Al and Fe, acquired before deposition. K is acquired from the original water content, and after deposition, from K-feldspar. As depth and temperature increase, kaolinite is destroyed, and Al is deposited between the expanded layers as hydroxy-Al to produce layers of dioctahedral chlorite. The rate of decrease of pore water content abruptly increases at 10,300 ft, as high pressures are encountered, and then decreases. The cation concentration increases to 10,000 ft, abruptly decreases by 20%, then remains relatively constant. During burial a physical permeability barrier is formed by the rapid dewatering mud. Upward migrating Ca precipitates as calcite, increasing the effectiveness of the barrier. Na diffuses through the barrier more easily than water; Cl diffuses through more easily than SO4 and HCO3. (Knapp-USGS)
W72-08998

EARTHFLOWS IN THE GRONDINES AND TROIS RIVIERES AREAS, QUEBEC,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
For primary bibliographic entry see Field 02J.
W72-09002

DEVELOPMENT OF ECONOMIC WATER HARVEST SYSTEMS FOR INCREASING WATER SUPPLY,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 03B.
W72-09060

2H. Lakes

PREDICTING LAKE EVAPORATION BY PERFORMANCE OF EVAPORATION PONDS, PANS AND TANKS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02D.
W72-08523

POLLUTION PATHWAYS IN THE GREAT LAKES,
For primary bibliographic entry see Field 05B.
W72-08532

A RANGE EXTENSION AND BASKING OBSERVATION OF THE BLANDING'S TURTLE IN NOVA SCOTIA,
Ross B. Dobson.
Can Field Nat. 85 (3): 255-256. 1971.
Identifiers: Basking, Blandings, Canada, Emydoidea-Blandingi, Extension, Nova-Scotia, Population, Range, Relict, Turtle.

Observations in 1970 of Blanding's Turtles (Emydoidea blandingi), in southwestern Nova Scotia extended the range of this relict, disjunct population by approximately 15 mi. to George Brook, Mersey River, 2 mi. below the outlet of Lake Rossignol. On April 30, observation of basking at Grafton Lake is the earliest spring sighting in the area and contradicts an earlier theory of the existence of separate basking and non-basking populations.--Copyright 1972, Biological Abstracts, Inc.
W72-08555

THE AGE AND GROWTH OF THE LARGEMOUTH BASS MICROPTERUS SALMOIDES (LACEPEDE), IN A THERMALLY LOADED RESERVOIR,
Missouri Univ., Columbia. Graduate School.
For primary bibliographic entry see Field 05C.
W72-08558

A KINETIC MODEL OF PHYTOPLANKTON GROWTH, AND ITS USE IN ALGAL CONTROL BY RESERVOIR MIXING,
Municipal Waterworks of Rotterdam (Netherlands).
For primary bibliographic entry see Field 05C.
W72-08559

ALGAL POPULATIONS IN MOSES LAKE, WASHINGTON: TEMPORAL AND SPATIAL DISTRIBUTION AND RELATIONSHIP WITH ENVIRONMENTAL PARAMETERS,
Washington Univ., Seattle.
For primary bibliographic entry see Field 05C.
W72-08560

WATER QUANTITY AND QUALITY STUDIES OF VANCOUVER LAKE, WASHINGTON,
Washington State Univ., Pullman. Sanitary Engineering Section; and Washington State Univ., Pullman. Hydraulic Section.
For primary bibliographic entry see Field 05C.
W72-08564

ADAPTIVE LEAF ARCHITECTURE IN EMERGENT AND FLOATING SPARGANIUM,
Nebraska Univ., Lincoln. Dept. of Botany.
For primary bibliographic entry see Field 05C.
W72-08566

AN INTERIM STUDY OF SOME PHYSICAL, CHEMICAL AND BIOLOGICAL PROPERTIES OF SELECTED OREGON LAKES,
Oregon State Dept. of Environmental Quality, Portland.
For primary bibliographic entry see Field 05C.
W72-08568

EFFECT OF BURULLUS LAKE BRACKISH WATER ON THE DISTRIBUTION OF SALTS AND ON THE SOIL PROFILE FORMATION IN SOILS ADJACENT TO THE LAKE,
Ministry of Agriculture, Cairo (Egypt). Soils Dept.
For primary bibliographic entry see Field 02G.
W72-08571

A PRELIMINARY SURVEY OF THE BENTHIC MACROFAUNA AND SEDIMENTS IN LOCHS ETIVE AND CRERAN, SEA-LOCHS ALONG THE WEST COAST OF SCOTLAND,
Dunstaffnage Marine Research Lab., Oban (Scotland).
For primary bibliographic entry see Field 05C.
W72-08572

ECONOMIC UTILIZATION OF LAKE ONEGA (ONEZHSKOYE OZERO KAK OB'YEKT KHOZYAYSTVENNOGO ISPOL'ZOVANIYA).
Laboratory of Limnology, Leningrad (USSR).

'Nauka', Leningradskoye Otdeleniye, 1970. 244 p.

Descriptors: *Lakes, *Lake basins, *Economics, *Water utilization, *Water management (Applied), Hydroelectric power, Water supply, Naviagtion, Transportation, Irrigation, Drainage systems, Sewage disposal, Environmental sanitation, Diversion, Fish management, Recreation, Inland waterways, Reservoirs, History, Planning.
Identifiers: *European USSR, *Lake Onega, Karelia, Hydropower, Balneology.

A study of the various uses to which Lake Onega, the second largest freshwater lake in Europe and the European USSR, can be put is examined. These uses include hydroelectric-power generation, domestic and industrial water supply, navigation and transportation, irrigation, sewage disposal and sanitation, water diversion, fisheries development, and recreation. (Josefson-USGS)
W72-08707

SURFACE AND INTERNAL SEICHES OF LAKES (SEYSHI NA OZERAKH--POVERKHNOSTNYYE I VNUTRENNIYE).
Limnologicheskii Institut, Irkutsk (USSR).

'Nauka', leningradskoye Otdeleniye, 1970. 68 p.

Descriptors: *Lakes, *Seiches, *Waves (Water), *Tides, *Wind tides, Winds, Wind velocity, Surges, Density stratification, Thermal stratification, Epilimnion, Hypolimnion, Thermocline, Water temperature, Water levels, Flow rates, Ice cover, Seasonal, Model studies, Equations.
Identifiers: *USSR, *Lake Baikal, Angara River, Metalimnion, Limnographs.

This collection of 6 papers examines surface and internal seiches on Lake Baikal and on the upper reach of the Angara River between the lake and Irkutsk. The titles of the papers are: (1) theory of internal seiches of lakes; (2) internal waves of Lake Baikal; (3) wind-driven waves on Lake Dal'neye; (4) seiches of Lake Baikal; (5) seiches and tides of Lake Baikal; and (6) propagation of seiches along the Angara River from Lake Baikal. (Josefson-USGS)
W72-08709

CURRENTS AND DIFFUSION OF LAKE BAIKAL WATERS (TECHENIYA I DIFFUZIYA VOD BAYKALA).
Limnologicheskii Institut, Irkutsk (USSR).

Trudy, Vol 14 (34), Leningrad, 1970. 214 p.

Descriptors: *Lakes, *Lake shores, *Lake basins, *Currents (Water), *Diffusion, Water circulation, Turbulence, Eddies, Stratification, Sedimentation, Isotope studies, Dye dispersion, Water properties, Water pollution sources, Littoral, Hydaqulics, Hydrodynamics, Meteorology, Model studies, Computers.
Identifiers: *USSR, *Lake Baikal, Water transport, Water samples, Dye clouds, Geostrophic motion, Biogenous components.

This collection of 15 papers is devoted to investigations of hydrologic and hydrophysical phenomena in waters of Lake Baikal in southern Siberia. Topics include: (1) statistical study of the velocity field of wind-driven currents in a tridimensional case; (2) geostrophic circulation of Lake Baikal waters during direct thermal stratification; (3) transport of water and structure of currents along the southern shore of Lake Baikal; (4) diffusion and currents in deep waters of Lake Baikal; (5) boundary of floodwater zones at the southern end of Lake Baikal; (6) modeling of tridimensional random walks on electronic computers for diffusion problems; (7) calculation of diffusion by random walks for a partial velocity field; (8) coefficients of horizontal macroturbulent mixing along southern shores of Lake Baikal; (9) use of fluorescein dye clouds to study horizontal dispersion at the southern end of Lake Baikal; (10) hydro-optic observations of the dynamics of Lake Baikal waters; (11) application of the isotopic method to study of diffusion processes in Lake Baikal; (12) vertical distribution of organic matter decomposition products in bottom sediments; (13) distribution of decomposition products of organic matter in bottom sediments; (14) a scheme for classification of water bodies; and (15) influence of Lake Baikal on the boundary layer of the atmosphere before complete ice cover. The material covered in the collection will be of particular value to limnologists, hydrologists, meteorologists, and other scientific workers. (See W72-08711 thru W72-08716) (Josefson-USGS)
W72-08710

TRANSPORT OF WATER AND STRUCTURE OF CURRENTS ALONG THE SOUTHERN SHORE OF LAKE BAIKAL (PERENOS VOD I STRUKTURA TECHENIY V PRIBREZHNOY ZONE YUZHNOGO BAYKALA),
Limnologicheskii Institut, Irkutsk (USSR).
V. I. Verbolov.
In: Techeniya i diffuziya vod Baykala; Adademiya Nauk SSSR Sibirskoye Otdeleniye, Limnologicheskiy Institut Trudy, Vol 14 (34), p 45-67, Leningrad, 1970. 13 fig, 7 tab, 22 ref.

Descriptors: *Lakes, *Lake shores, *Water circulation, *Currents (Water), *Hydraulics, Eddies, Turbulence, Velocity, Wind velocity, Winds, Atmospheric pressure, Streamflow, Buoys, Current meters, Littoral, Seasonal, Anisotropy, Statistical methods, Correlation analysis.
Identifiers: *USSR, *Lake Baikal, *Water transport.

The first results of measurements of water currents by BPV-2 current meters installed on buoys at 8 points along the southern shore of Lake Baikal are presented. Measurements covering periods of 7-20 days were conducted between June and December 1965 at water depths ranging from 10 m to 1,207 m. The net transport of water near the southeast shore of the lake has an easterly direction and that near the northwest shore, a westerly direction. Mean transport velocities during the navigation period are low, ranging between 1 and 3 cm/sec. Water transport velocities are seasonal, being least in summer and greatest in the fall, especially in November and December. Velocity and direction are presumably produced by the action of wind and atmospheric pressure, with streamflow playing a secondary role. Large, turbulent eddies contribute significantly to the formation of the velocity field and its regime. Eddies in near-shore waters of the lake are, in most cases, anisotropic. Eddy deformation decreases with increasing distance from the shore. (See also W72-08710) (Josefson-USGS)
W72-08711

BOUNDARY OF FLOODWATER ZONES AT THE SOUTHERN END OF LAKE BAIKAL (RASPROSTRANENIYE PAVODOCHNYKH VOD V YUZHNOM BAYKALE),
Limnologicheskii Institut, Irkutsk (USSR).
L. M. Galkin, V. M. Sokol'nikov, and M. N. Shimarayev.
In: Techeniya i diffuziya vod Baykala; Akademiya Nauk SSSR Sibirskoye Otdeleniye, Limnologicheskiy Institut Trudy, Vol 14 (34), p 74-80, Leningrad, 1970. 5 fig, 2 ref.

Descriptors: *Lakes, *Lake shores, *Littoral, *Floodwater, *Water circulation, Movement, Rivers, Currents (Water), Water properties, Water temperature, Turbidity, Color, Rain, Water pollution sources, Summer.
Identifiers: *USSR, *Lake Baikal, Water transport.

A study of pollution zones formed by floodwaters during years of summer rain was based on investigations begun in July 1962 at the southern end of Lake Baikal and continued in July 1966 following a period of heavy rain (70-110 mm) in late June in the southeastern regions of the Irkutsk Oblast. The Presence of a visible boundary between clear lake water and muddy river water confined to a relatively narrow (1-3 km wide) littoral zone of the lake was established. A continuous zone of polluted river water was observed in 1962 along the south and southeast shores of the lake, the width of the zone increasing in the vicinity of river mouths. In 1966 the zone of polluted river water was confined to the region between the Utulik and Vydrina Rivers, the width of the zone increasing in the vicinity of the mouths of the Utulik, Solzan, Khara-Murin, Snezhnaya and Mishikha Rivers. A westerly movement of water was observed along the northwest shores of the lake and an easterly movement along the south and southeast shores. (See also W72-08710) (Josefson-USGS)
W72-08712

USE OF FLUORESCEIN DYE CLOUDS TO STUDY HORIZONTAL DISPERSION AT THE SOUTHERN END OF LAKE BAIKAL (ISSLEDOVANIYE GORIZONTAL'NOY DIFFUZII V YUZHNOM BAYKALE S POMOSHCH'YU PYATEN FLUORESTSEINA),
Limnologicheskii Institut, Irkutsk (USSR).
P. P. Sherstyankin.
In: Techeniya i diffuziya vod Baykala; Akademiya Nauk SSSR Sibirskoye Otdeleniye, Limnologicheskiy Institut Trudy, Vol 14 (34), p 132-136, Leningrad, 1970. 2 fig, 2 tab, 2 ref.

Descriptors: *Lakes, *Fluorescent dye, *Dye concentrations, *Dye dispersion, Dye releases, Rhodamine, Diffusion, Aerial photography, Littoral.
Identifiers: *USSR, *Lake Baikal, *Dye clouds, *Dispersion rates, *Fluorescein.

Investigations were conducted in 1965 at the southern end of Lake Baikal to study dispersion of fluorescent dyes in the littoral zone adjacent to the Solzan River. Concentrated solutions of fluorescein were released from an aircraft flying at a height of about 200 m. The dye cloud formed was then photographed from an aircraft at specific time intervals. Calculation of the rate of horizontal dispersion was based on the equation of Joseph and Sendner for instantaneous single-point injection. The average rate of dispersion during the 150-min period beginning 10 min after dye injection was 0.20 cm/sec. (See also W72-08710) (Josefson-USGS)
W72-08713

APPLICATION OF THE ISOTOPIC METHOD TO STUDY OF MIXING PROCESSES IN LAKE BAIKAL (PRIMENENIYE IZOTOPNOGO METODA DLYA IZUCHENIYA PROTSESSOV VODOOBMENA OZERA BAYKAL),
Limnologicheskii Institut, Irkutsk (USSR).
V. N. Soyfer, V. S. Brezgunov, V. I. Verbolov, K. K. Votintsev, and V. V. Romanov.
In: Techeniya i diffuziya vod Baykala; Akademiya Nauk SSSR Sibirskoye Otdeleniye, Limnologicheskiy Institut Trudy, Vol 14 (34), p 146-153, Leningrad, 1970. 3 fig, 2 tab, 15 ref.

Descriptors: *Hydrology, *Lakes, *Lake basins, *Diffusion, *Isotope studies, Tritium, Deuterium, Oxygen isotopes, Water circulation, Movement, Depth, Stratification, Seasonal.
Identifiers: *USSR, *Lake Baikal, *Water exchange, Water samples.

Water samples were collected in late August 1964-65 by the All-Union Scientific Research Institute of Nuclear Geophysics and Geochemistry and by the Limnological Institute of the Siberian Division of the USSR Academy of Sciences to study vertical distribution of tritium, deuterium, and oxygen-18 in waters of Lake Baikal for their possible use in analyzing hydrologic processes in the lake. The tritium regime in all parts of the lake is determined by streamflow, water volume, and horizontal advection of the lake waters. Two maxima in the distribution of tritium are identified: (1) at a depth of about 100 m; and (2) at depths of about 500 m at the northern end and middle of the lake and about 900 m at the southern end. The minimum concentration of tritium is observed at a depth of 200-300 m, with reduced concentrations also typical of bottom and surface layers of the water. At the southern end and middle of the lake, tritium concentration in the second maximum equals or exceeds that in the first. Unlike deuterium and 0-18, whose concentrations in the lake are similar to those in Siberian rivers, tritium can be used as an indicator of the movement of lake waters. Data on vertical distribution of tritium in August attest to an intensive exchange of water between surface and deep layers and to possible separation of the water layers into zones on the basis of diffusion intensity. (See also W72-08710) (Josefson-USGS)
W72-08714

VERTICAL DISTRIBUTION OF ORGANIC--MATTER DECOMPOSITION PRODUCTS IN BOTTOM SEDIMENTS (O VERTIKAL'NOM RASPREDELENII PRODUKTOV RASPADA ORGANICHESKOGO VESHCHESTVA V DONNYKH OTLOZHENIYAKH),
Limnologicheskii Institut, Irkutsk (USSR).
L. M. Galkin, and I. B. Mizandrontsev.
In: Techeniya i diffuziya vod Baykala; Akademiya Nauk SSSR Sibirskoye Otdeleniye, Limnologicheskiy Institut Trudy, Vol 14 (34), p 153-161, Leningrad, 1970. 1 fig, 1 tab, 21 ref.

Descriptors: *Sedimentation, *Bottom sediments, *Chemical degradation, *Organic matter, Decomposing organic matter, Detritus, Diagenesis, Sedimentation rates, Sediment-water interfaces, Connate water, Aqueous solutions, Nitrogen compounds, Ammonia, Nitrites, Nitrates, Diffusion, Bodies of water.
Identifiers: *USSR, Biogenous components.

The suggested mechanism of redistribution of organic-matter decomposition products in bottom sediments of a water body with stationary conditions of sedimentation and organic-matter decomposition does not conflict with data obtained for actual bodies of water. The content and vertical distribution of mineralization products of organic remains in connate-water solutions can be determined by the amount of organic matter deposited, the rate of organic matter decomposition, the sedimentation rate, and by the redistribution by diffusion of the mineral compounds of biogenous components. Results of theoretical calculations are compared with data on the actual vertical distribution of ammonium nitrogen in connate-water solutions of Lake Baikal, the Caspian, Black, and Baltic Seas, and the Pacific Ocean. (See also W72-08710) (Josefson-USGS)
W72-08715

DISTRIBUTION OF MULTISTAGE DECOMPOSITION PRODUCTS OF ORGANIC MATTER IN BOTTOM SEDIMENTS (O RASPREDELENII PRODUKTOV MNOGOSTADIYNOGO RASPADA ORGANICHESKOGO VESHCHESTVA V DONNYKH OTLOZHENIYAKH),
Limnologicheskii Institut, Irkutsk (USSR).
L. M. Galkin, and I. B. Mizandrontsev.
In: Techeniya i diffuziya vod Baykala; Akademiya Nauk SSSR Sibirskoye Otdeleniye, Limnologicheskiy Institut Trudy, Vol 14 (34), p 162-169, Leningrad, 1970. 2 fig, 3 ref.

Descriptors: *Sedimentation, *Bottom sediments, *Chemical degradation, *Organic matter, Decomposing organic matter, Detritus, Sediment-water interfaces, Connate water, Aqueous solutions, Diagenesis, Sedimentation rates, Diffusion, Bodies of water.
Identifiers: *USSR.

The diffusion of soluble decomposition products of organic remains in bottom sediments of water bodies was examined. A detailed theoretical study was made of the vertical distribution of the first intermediate decomposition product, on the basis of which maximum concentrations of the product in connate-water solutions and extremal values of the sediment-water interface were identified as a function of the sedimentation rate. Results obtained from the analysis agree with the conclusions reached by N. M. Strakhov in his study of the actual vertical distribution of organic matter in marine and ocean sediments. (See also W72-08710) (Josefson-USGS)
W72-08716

1971 PROGRAM OF THE GREAT LAKES RESEARCH CENTER.
Lake Survey Center, Detroit, Mich.

Available from NTIS, Springfield, Va. 22151 as COM 71-00662, $3.00 paper copy, $0.95 microfiche. Report No 71052405, 1971. 55 p.

Descriptors: *Great Lakes, *Lake morphology, Limnology, *Water supply, Water quality, Water pollution sources, Lake stages, Evaporation, Precipitation (Atmospheric), Hydrologic cycle, Hydrologic data, Navigation, Industries, Ecology, Environmental effects, Population, Forecasting, Water level fluctuations.

Research to establish the present condition of the Great Lakes has as one of its primary objectives to define and quantify the complex interrelationships of the natural processes occurring in the water bodies and at the air-water and water-sediment interfaces. In 1960 more than 25 million people lived within the Great Lakes area, and by 1980, 44 million people will live there. The Great Lakes supply 4 billion gallons per day of water to 18 million people, and 8 billion gallons per day to industry. Although the lakes have a seemingly unlimited water supply there are problems with the water-supply cycles. Excessive water supply causes high lake levels and extensive damage to shoreline property due to flooding and wave action. In low water periods, losses occur from reduced navigational depths and power generation. Plans for diverting water into the lakes are proposed and discussed. (Woodard-USGS)
W72-08717

RADIOCARBON DATING OF EAST AFRICAN LAKE LEVELS,
Chicago Univ., Ill.
K. W. Butzer, G. L. Isaac, J. L. Richardson, and C. Washbourn-Kamau.
Science, Vol 175, No 4027, p 1069-1076, March 10, 1972. 3 fig, 2 tab, 59 ref.

Descriptors: *Lakes, *Recent epoch, *Radioactive dating, *Paleoclimatology, Hydrologic properties, Geomorphology, Tropical regions, Environmental effects, Wet climates, Lake stages, Terraces (Geologic), Mud flats, Shore, Littoral, Water level fluctuations, Carbon radioisotopes.
Identifiers: *African lake levels, Carbon-14 dating, Depositional sequences.

New observations are described that provide fresh insight into late Quaternary paleoclimates. The writers have, jointly or independently over several years, studied depositional sequences and shorelines at various places in East Africa with extensive carbon-14 dating techniques that permit objective correlation on a regional basis. Hydrological parameters are given to show graphically the balancing covariations of precipitation and evaporatio, with a particular runoff constant K, adequate to maintain Lake Nakuru at +180 m. The fluctuations of the East African lakes are summarized. Lake Rudolf (present surface area 7500 sq m) is the largest nonoutlet lake. Its maximum level was reached 9,500 yr ago; levels fluctuated between +60 and +80 m until 7,500 yr ago when Lake Rudolf shrank to present size. Evidence presented shows lack of correlations between glacial changes and intervals of high lake levels as suggested for North American and Eurasian areas. The computations made for the early Holocene lakes Nakuru and Naivasha, as well as for oscillations of Lake Rudolf and Lake Victoria in recent decades, suggest that many or most of the high levels were associated with a modest but significant increase in precipitation. (Lang-USGS)
W72-08731

THE DEVELOPMENT OF LAKE PHYAEJAERI IN SOUTHERN FINLAND CONSIDERING SEDIMENT AND DIATOM STUDIES,
Institute of Technology, Otaniemi (Finland). Geologiska Institutionen.
Esa Kukkonen, and Risto Tynni.
Acta Bot Fenn. 90. 1970. 3-30. English summary.
Identifiers: Development, Diatom, Finland, History, Lake, Minerals, Phyaejaervi, Sediment, Southern.

History of the lake during the past 3700 yr is based on annual varving, pollen and chemical analysis of the nutrient-rich sediments. The sulfide-bearing portions during summer are rich in diatoms. Ca, K, P, N and Fe of the humus-bearing sediments are quantitatively determined.--Copyright 1971, Biological Abstracts, Inc.
W72-08751

BIONOMICS OF THE GOBIID FISH CHAENOGOBIUS UROTAENIA (HILGENDORF) IN LAKES KASUMIGAURA AND KITAURA, (IN JAPANESE),
Naomasa Takeuchi.
Misc Rep Res Inst Nat Resour. 75. 16-24. 1971. Illus. Map. English summary.
Identifiers: Bionomics, Chaenogobius-Urotaenia, Colorations, Eggs, Fish, Food, Gobiid, Japan, Kasumigaura, Kitaura, Lakes, Spawning.

C. urotaenia (Hilgendorf), a gobiid fish of about 70 to 100 mm in total length, inhabits the lakes and rivers of Japan, Sakhalin and Korea. In the Lakes Kasumigaura and Kitaura, a large amount of its young is caught from May to July with the setting-net and used as human food. During the fishing season, it does not stay on the bottom, but swims slowly in the surface of the middle layer of the water. The goby spawns from March to May. In breeding females, there are nuptial colorations appearing along the lateral parts of the body. The eggs are laid on the under surface of stones, mussel shells, vinyl sheets and other objects deposited on the bottom about 10 to 50 cm deep along the sandy and muddy shores. In 1 spawning bed, there are about 6000 to 1650 eggs attached on it, and all of them are of the same developmental stage. A single female has from 1600 to 3000 eggs in her ovary and will spawn once or more during 1 season. In these lakes, the adult fish is usually

seen from winter to spring, and is never found in summer. Most individuals attain sexual maturity within a year.--Copyright 1971, Biological Abstracts, Inc.
W72-08761

OBSERVATIONS ON THE PLANKTON POPULATION OF THE COCHIN HARBOR WATERS, (IN MALAYALAM),
Marine Biological Lab., Trivandrum (India).
P. A. John.
J Kerala Acad Biol. Vol 2, No 2, p 2-16. 1970. Illus. English summary.
Identifiers: *Cochin Harbor, Copepods, Corophium, Eocuma, Fish, Harbor, Lucifer, Noctiluca, *Plankton, Pleurobrachia, Polychaete, Sagitta, Malayia.

The seasonal variations of macroplankton and its relation to the hydrographic conditions of the waters of Cochin harbor, situated at the mouth of the largest lake in Kerala i.e., Vembanad lake, were studied for a period of 3 consecutive years. No changes could be noticed in the surface temperature of O2 content of the water, correlated to any season. But, related to the monsoon, the salinity values showed a salt water period extending between Jan. and April, near freshwater period from June to Aug. and brackish water period from Sept. to Dec. Organisms totally absent during the salt water period were Eocuma sp. Tanaids, and Corophium sp., suggesting that they owe their origin to the harbor waters itself. The abundance of pelecypod and gastropod larvae also showed that their adults are indigenous to the backwater. Noctiluca, Medusae, Pleurobrachia sp. and Sagitta sp. occurred exclusively during the salt water period. The polychaete larvae, nauplius larvae, mysids, caridean larbae, brachyuran zoea and Lucifer were maximum during salt water period, but totally absent during near freshwater period showing that these typically marine forms can live in brackish water. Copepods and fish larvae occurred in the plankton throughout the year.--Copyright 1972, Biological Abstracts, Inc.
W72-08781

A POSTGLACIAL FRESHWATER DRUM (APLODINOTUS GRUNNIENS) FROM ONTARIO, AND COMMENTS ON THE ZOOGEOGRAPHY OF THE SPECIES,
National Museum of Natural Sciences, Ottawa (Ontario).
C. R. Harington.
Canadian Journal of Earth Sciences, Vol 8, No 9, p 1137-1144. 1971. Illus.
Identifiers: Aplodinotus grunniens, Canada, *Drum, Ontario, *Postglacial species, *Zoogeography.

An A. grunniens specimen from postglacial deposits of northern Ontario indicates the species former presence in Lake Barlow-Ojibway. The fact that the species survives in Lakes Abitibi and Timiskaming may be best explained by its having entered Lake Barlow-Ojibway from the west during the Gimli phase of Lake Agassiz about 8000 yr ago, but this hypothesis cannot be confirmed with the existing evidence.--Copyright 1972, Biological Abstracts, Inc.
W72-08784

OBSERVATIONS ON THE BENTHIC FAUNA OF THE INLET-LAKE COMPLEX OF CANANEIA (SAO PAULO),
Sao Paulo Univ. (Brazil). Instituto Oceanografico.
L. R. Tommasi.
Bol Inst Oceanogr. Vol 19, p 43-56, 1970. Map. English summary.
Identifiers: *Benthic fauna, Brazil, *Cananeia, Inlet, Kalliapseudes schubartii, Lake, Littoridina australis, Littorina australis nana, Macoma sp, Phoronis sp, Renilla reniformis, Sao Paulo, Tellina alternata, Virgularia sp.

The benthic fauna of the muddy bottoms of the estuarine lagoon complex of Cananeia is poor. It is dominated by the polychaete species. The gastropod Littoridina australis var. nana is abundant in the northern region of the Cananeia island. Some species occur only in the Trapande bay near the Cananeia bar. Five faunistic zones were recognized in the region: zone of Renilla reniformis, Virgularia sp. and ophiuroids, zone of Macoma sp. and Tellina alternata, zone of Kalliapseudes schubartii and Phoronis sp., zone of Littorina australis var. nana and zone of hard bottoms. Trapande bay presents the richest muddy infralittoral benthic fauna of the complex. The influence of rivers and 'marigots' in this fauna is pronounced. The fauna of the infralittoral stone bottom of Casqueiro Island is described with a hypothesis explaining their existence.--Copyright 1972, Biological Abstracts, Inc.
W72-08786

THE ORGANIC MATTER BUDGET OF A CENTRAL TEXAS RESERVOIR,
Baylor Univ., Waco, Tex. Dept. of Biology.
For primary bibliographic entry see Field 05B.
W72-08801

OXYGEN AND CARBON ISOTOPIC COMPOSITION OF WEST TEXAS LAKE CARBONATES,
Utah Univ., Salt Lake City. Dept. of Mining and Geological Engineering.
W. T. Parry, C. C. Reeves, Jr., and J. W. Leach.
Geochimica et Cosmochimica Acta, Vol 34, No 7, p 825-830, 1970. 1 fig, 1 tab, 7 ref. NSF Grant 292.

Descriptors: *Lakes, *Carbonates, *Texas, *Isotope studies, Oxygen, Carbon, X-ray diffraction, Data collections, Analytical techniques, Calcite, Dolomite, Sampling, Cores, Geology.
Identifiers: Oxygen isotopic content, Carbon isotopic content, Lacustrine carbonates.

Fourteen lacustrine dolomite samples and nine lacustrine calcite samples were collected from six lake basins on the southern High Plains of Texas to study oxygen and carbon isotopic composition of the lake carbonates. Mineralogical composition of the samples was determined by X-ray diffraction analysis. No calcite was detected in the X-ray diffractograms of the dolomite samples; likewise, no dolomite was detected in the diffractograms of the calcite samples. Carbon and oxygen isotopic compositions of West Texas lacustrine carbonates are tabulated and stable carbon and oxygen isotopic compositions are illustrated. The range in oxygen isotopic content for fourteen dolomites was plus or minus 5.8 to -3.4 per mil (mean plus or minus 0.9), and the range in carbon isotopic content was plus or minus 5.8 to -3.1 per mil (mean plus or minus 1.4). The range in oxygen isotopic content for nine calcites was -5.6 to -3.7 per mil (mean -4.4), and the range in carbon isotopic content was -6.1 to -0.9 per mil (mean -4.3). (Woodard-USGS)
W72-08821

MATHEMATICAL MODELS: PLANNING TOOLS FOR THE GREAT LAKES,
Michigan State Univ., East Lansing; and Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 06A.
W72-08971

PROBLEM LAKES IN THE UNITED STATES,
Wisconsin Univ., Madison. Water Resources Center.
M. J. Ketelle, and P. D. Uttormark.
Copy available from GPO Sup Doc, $2.00; microfiche from NTIS as PB-209 864, $0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1971. 282 p, 53 ref. EPA Program 16010 EHR 12/71.

Descriptors: *Lakes, *Eutrophication, *United States, Water pollution control, Water pollution sources, Water pollution effects.

A survey of 452 eutrophic lakes was compiled based on responses from 40 states requesting information as to (a) Name, location, size, depth; (b) Description of the problem, including accounts of previous corrective treatments, if any; (c) Remedial action that might be appropriate; (d) A description of available background data, indicating whether sufficient data exists to document a change if rehabilitation were undertaken. The study comprises 340 lakes which are larger than 100 surface acres, 44 in the 51-100 acre size, and 68 smaller than 50 surface acres. The compilation represents lakes which have, in view of the respondents, deteriorated to the extent that rehabilitation is desirable. Categories of the problems in the survey were: nuisance algal growth, nuisance aquatic vegetation, fishkills, bacterial contamination, toxic contamination, oil brines, unstable water levels, siltation, excessive dissolved solids, and unspecified eutrophic conditions. Sources contributing to these problems were classified in two general categories--concentrated sources and diffused sources. Indication is given, where available, whether progress has been made to eliminate the pollution source or whether the source has already been eliminated. (EPA abstract)
W72-08987

VITAMIN B12 PRODUCTION AND DEPLETION IN A NATURALLY OCCURRING EUTROPHIC LAKE,
Oregon State Univ., Corvallis. Dept. of Microbiology; and Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 05C.
W72-08989

COMPUTER SIMULATION MODEL OF COASTAL PROCESSES IN EASTERN LAKE MICHIGAN,
Williams Coll., Williamstown, Mass.
W. T. Fox, and R. A. Davis, Jr.
Technical Report No 5, December 15, 1971. 114 p, 42 fig, 5 tab, 36 ref, 4 append. Task No. 388-092. ONR Contract N00014-69-C-0151.

Descriptors: *Beach erosion, *Forecasting, *Model studies, *Lake Michigan, *Computer models, Winds, Waves (Water), Mathematical studies, Hydrologic data, Input-output analysis, Storms, Sediment transport, Currents (Water), Littoral drift, Sand bars.

A computer simulation model is used to study the relationships among barometric pressure, wind, waves, longshore currents, beach erosion, and bar migration on the eastern shore of Lake Michigan. Harmonic trend analysis with a single Fourier series is used to represent the major trends in weather and wave parameters. In the simulation model, barometric pressure is plotted as a function of time and longshore current velocity is computed as the first derivative of barometric pressure. Breaker height closely approximates a modified form of the second derivative of barometric pressure. Daily profiles provide data for nearshore topographic maps. For the simulation model, the nearshore area is broken down into components including beach, foreshore, plunge zone, trough and bar. A gently sloping linear plus quadratic surface is used to represent the barless topography in the nearshore area. Bars and troughs generated by normal and inverted normal curves are superimposed on the linear plus quadratic surface. The ultimate aim of the model is to predict the rates and magnitude of coastal processes and their effects on the beach and nearshore topography. (Woodard-USGS)
W72-08991

REAL-ESTATE LAKES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 03D.
W72-08997

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS AND ADJOINING AREAS, APRIL 1965 - SEPTEMBER 1969,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 05A.
W72-09000

SOME ECOLOGICAL EFFECTS OF ARTIFICIAL CIRCULATION ON A SMALL EUTROPHIC NEW HAMPSHIRE LAKE,
New Hampshire Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-09061

DISTRIBUTION OF PHYTOPLANKTON IN A POLLUTED SALINE LAKE, ONONDAGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Div. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W72-09111

SECRETION OF DISSOLVED ORGANIC CARBON AND NITROGEN BY AQUATIC MACROPHYTES,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 05C.
W72-09127

A HISTORY OF THE LAKE-WEED INFESTATION OF THE ROTORUA LAKES AND THE LAKES OF THE WAIRATA HYDRO-ELECTRIC SYSTEM,
Auckland Univ. (New Zealand).
For primary bibliographic entry see Field 04A.
W72-09135

WATER CHARACTERISTICS AND RECENT DIATOM ASSEMBLAGES OF LAKE NOJIRI, (IN JAPANESE),
Shinshu Univ., Matsumoto (Japan). Dept. of Geology.
Seiko Tamura, Kunihiko Yamada, Yasuyo Noguchi, and Yutaka Saito.
Bull Inst Nat Educ Shiga Heights. 8. 107-120. 1969. Illus. Map. English summary.
Identifiers: Assemblages, Diatom, Japan, Lake, Nojiri.

Water surface temperature, pH, electrical conductivity and water transparency are recorded. Also, the diatom species are ecologically and morphologically evaluated.--Copyright 1971, Biological Abstracts, Inc.
W72-09137

2I. Water in Plants

ADAPTIVE LEAF ARCHITECTURE IN EMERGENT AND FLOATING SPARGANIUM,
Nebraska Univ., Lincoln. Dept. of Botany.
For primary bibliographic entry see Field 05C.
W72-08566

ACTUAL EVAPOTRANSPIRATION AS DETERMINED FROM SOIL-WATER AND CANOPY CHARACTERISTICS AND POTENTIAL EVAPOTRANSPIRATION.
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02D.
W72-08720

WATER BALANCE OF A SEED ONION FIELD,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02D.
W72-08721

EXCESSIVELY HIGH TEMPERATURES OF SEED ONION UMBELS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02D.
W72-08722

SEED ONION TEMPERATURES AND THEIR EFFECT ON STOMATA,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02D.
W72-08723

ENERGY, WIND, AND AIR TEMPERATURE RELATIONS OF SCREENED BREEDING CAGES,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02D.
W72-08724

ONION FIELD EVAPOTRANSPIRATION MEASURED BY BOWEN RATION AND LYSIMETER.
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02D.
W72-08725

A COMPARISON OF TWO WAYS OF USING A METHOD FOR CALCULATING ROW CROP TRANSPIRATIONS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02D.
W72-08726

ONION UMBEL TEMPERATURE PROFILES AND TRANSPIRATION RATES.
For primary bibliographic entry see Field 02D.
W72-08727

VEGETATION PRODUCTIVITY VARIATION IN CONNECTION WITH HYDROTHERMAL CONDITIONS (IN RUSSIAN),
Akademiya Nauk Azerbaidzhanskoi SSR, Baku. Institut Pochvovedeniya i Agrokhimii.
V. R. Volobuev.
Izv Akad Nauk SSSR Ser Biol. 3. 374-381. 1970. Illus. English summary.
Identifiers: Connection, Formation, Formulas, Humidity, Hydro, Productivity, Soil, Thermal, Vegetation.

The dependence of energy consumption connected with soil formation (Q) on the radiation balance of the Earth's surface (R) and relative humidity K : Q = Re -1/mK contains the parameter m. The latter may be considered as reflecting the 'biological activity' of the biogeocoenose. A connection between the possible energy expenditures connected with soil formation and the amount of yearly increment of the plant mass (v) and described by the formula: V = Qn has been found. The parameter in this formula reflects the influence of humidity on the productivity of plant associations. The latter dependence reflects in a mathematical form the connection between the process of soil formation and vegetation.--Copyright 1971, Biological Abstracts, Inc.
W72-08734

STATE OF THE WATER IN RELATION TO THE SHAPE OF THE LEAF IN SAMBUCUS NIGRA L, (IN RUSSIAN),
M. V. Sivtsev.
Biol Nauk. 13 (8): 75-78. 1970. Illus.
Identifiers: Capacity, Diffuse, Drought, Leaf, Lobes, Relation, Resistance, Retaining, Sambucus-Nigra-D, Shape, Vegetation.

The water-retaining capacity and the concentration of bound water was studied in leaves of 2 forms of S. nigra: with diffuse (laciniate) and whole (typical) lobes. In leaves with diffuse lobes the water-retaining capacity at the beginning of the growing period (in Apr.) was lower than in leaves which had whole lobes. In May this index was the same in both cases. At the end of leaf formation (July, Aug.), the hottest and driest period, the water-retaining capacity of leaves with diffuse lobes was higher than in leaves with whole lobes. At all periods of vegetation the leaves with diffuse lobes contained more bound water than leaves having whole lobes. The occurrence of diffuse leaves was an adaptation to dryness and serves as an index of drought resistance.-Copyright 1972, Biological Abstracts, Inc.
W72-08742

THE EYE LENS AS AN AGE INDICATOR IN FRESH WATER DRUM,
Ohio State Univ., Columbus. Dept. of Zoology.
D. R. Burkett, and B. W. Jackson.
American Midland Naturalist. Vol 85, No 1, p 222-225. 1971. Illus.
Identifiers: Aplodinotus grunniens, *Drum, *Age indicator, *Eye lens.

The eye lens weight of Aplodinotus grunniens was useful in determining annual age groups. A regression of scale age-lens wieght data provided a method for approximating age of individuals, although some assessments would be misleading due to the overlap in lens weights between annual groups. In annual groups, neither sex had a mean lens weight larger than the other. Validity of the otolith technique for age determination was not demonstrated.--Copyright 1972, Biological Abstracts, Inc.
W72-08774

PRELIMINARY FAUNISTIC OBSERVATIONS ON THE GARIGLIANO RIVER IN THE YEARS 1968 AND 1969,
Milan Univ. (Italy). Laboratorio di Zoologia.
V. Parisi, P. Magnetti, Michelangeli M. Chierici, Paoletti A. DiChiara, and E. Smedile.
Ist Lombardo Accad Sci Lett Rend Sci Biol Med B. Vol 104, No 1, p 146-169. 1970. Map. English summary.
Identifiers: *Distribution, Fish, *Food chains, *Garigliano River (Italy), *Fauna.

The data gathered in the first 2 yr of research (1968-1969) in the Garigliano river have a particular ecologic and zoogeographic interest, since the Garigliano has a very constant flow in respect to other rivers of the Appennines and its bed is almost exclusively soft. So far 73 animal species have been determined. The distribution of many of these, which is often influenced by the salinity, by the pronounced organic drift and the presence of terminal sources which are tributaries of the mountain stretch, is described. The principal food chains are also described, with special reference to fishes. Moreover, some lateral surroundings were examined, such as the Ausente affluent and irrigation canals. Almost all the animal population consists of freshwater species.--Copyright 1972, Biological Abstracts, Inc.
W72-08782

BIOMASS TURNOVER, RESPIRATION, AND INTER-POPULATION VARIATION IN THE STREAM LIMPET, FERRISSIA RIVULARIS (SAY),
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Biology.
A. J. Burky.
Ecological Monographs, Vol 41, No 3, p 235-251. 1971. Illus.
Identifiers: *Biomass, Ferrissia-rivularis, *Limpet, Fish population, *Respiration, Stream, Turnover.

The stream limpet F. rivularis, which occurs extensively in North America and is ubiquitous in streams of upper New York State, was studied from 2 distinct populations, one located in the Canandaigua Outlet at Alloway, N.Y. (AL) and the other is Black Creek at Cleveland, N.Y. (BC).

These environments differ substantially, that at AL being the more eutrophic. At BC there is 1 generation per year, but at AL there are 2 generations per year and more rapid growth rates. Thirteen mo. is the adult life span for BC limpets, whereas at AL 11 and 3 mo. are normal for spring and summer adults respectively. At BC 8.4 eggs per limpet are laid, and 34.8 eggs per limpet are laid by spring adults at AL. Biomass and egg production are assessed as total C (equivalent to calorific measures) and expressed as biomass-turnover rates (growth and egg production). Egg-production rates can be double those for growth at AL; at BC egg-production rates are usually less than those for growth. This is partly a consequence of greater primary productivity at AL, but may also reflect implied genetic differences. Limpets at BC build up C during late summer and early fall; an increase in the C:N ratio (to 4.8) indicates an accumulation of storage compounds. During the winter the C:N ratio decreases, and during spring breeding a more marked loss of C is associated with the egg laying. In field-acclimated BC animals, respiration is lowest during the winter; during the spring, respiratory rate is closely correlated with temperature and egg-laying intensity. O-2-consumption measurements at 10 degree and 20 degree C for all seasons reveal that these limpets show reverse acclimation at low temperature. This acclimation pattern is accompanied by a decrease in Q10 (3.3 to 2.1) which can act to dampen the effects of winter temperature fluctuations. Energy balance (respiration, growth, egg production) is expressed as rates of C turnover for the population at BC. Respiration rates are greatest during the summer and spring and reflect increased assimilation due to growth or reproduction or both. The total C turnover per year is approximately 1.25 g/m2 to the second power. Data on energy balance emphasize the adaptive importance of reverse acclimation at times of low energy input.--Copyright 1972, Biological Abstracts, Inc.
W72-08788

SOME CLIMATIC EFFECTS ON FLOWERING AND FRUITING OF 'BREWSTER' LYCHEES IN FLORIDA,
Florida Univ., Homestead. Agricultural Research and Educational Center.
T. W. Young.
Proc Fla State Hort Soc. 83: 362-367. 1970.
Identifiers: Brewster, Climatic, Florida, Flowering, Fruiting, Litchi-Chinensis-D, Litchis-D, Moisture, Nutrition, Soil, Temperature.

A soil moisture deficit and recurring temperatures between about 45 and 32 F in the fall winter before bloom tend to promote flowering and fruiting of 'Brewster' lychees (Litchi chinensis Sonn) in Florida. Low temperatures appear to play a stronger role in this respect than does soil moisture where trees are deeply rooted. Also, the total duration of relatively low temperatures, rather than the frequency or time of occurrence during the critical period, seemed to be the important thing. Flowering and fruiting generally were better in seasons with 200 or more hr of temperatures at or below 45 F than in seasons with only about 150 hr in this range. There were exceptions, however, where flowering and fruiting were good to fair with the lesser amount of cold. There were some indications that nutritional factors, either external or internal, might be involved in such exceptions.--Copyright 1971, Biological Abstracts, Inc.
W72-08863

ESTIMATING LEAF WATER CONTENT BY REFLECTANCE MEASUREMENTS,
Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 03F.
W72-08892

DIURNAL CHANGES IN COTTON LEAF AND PETIOLE MOISTURE CONTENT AS RELATED TO ENVIRONMENTAL MOISTURE STRESS,
Texas A and M Univ., El Paso. Agricultural Research Station; and Texas A and M Univ., Pecos. Agricultural Research Station.
For primary bibliographic entry see Field 03F.
W72-08893

SOIL WATER MOVEMENT TO GERMINATING SEEDS,
Volcani Inst. of Agricultural Research, Rehovoth (Israel).
For primary bibliographic entry see Field 02G.
W72-08895

INFLUENCE OF SOIL WATER STRESS ON EVAPORATION, ROOT ABSORPTION, AND INTERNAL WATER STATUS OF COTTON,
Texas A and M Univ., College Station. Dept. of Plant Sciences; and Agricultural Research Service, Temple, Tex. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 03F.
W72-08897

BEHAVIOR OF CORN AND SORGHUM UNDER WATER STRESS AND DURING RECOVERY,
Duke Univ., Durham, N.C. Dept. of Botany.
For primary bibliographic entry see Field 03F.
W72-08899

SPECIES, SOILS, CLIMATE, AND FERTILITY AS RELATED TO TOP GROWTH AND EVAPOTRANSPIRATION,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 02D.
W72-08934

EVAPOTRANSPIRATION AND ROOT GROWTH,
Montana State Univ., Bozeman. Dept. of Soils.
For primary bibliographic entry see Field 02D.
W72-08935

ROLE OF PLANT CANOPIES IN EVAPOTRANSPIRATION,
South Dakota State Univ., Brookings.
For primary bibliographic entry see Field 02D.
W72-08937

2J. Erosion and Sedimentation

SEDIMENT TRANSPORT AND TURBIDITY IN THE EEL RIVER BASIN, CALIFORNIA,
Geological Survey, Washington, D. C.
W. M. Brown III, and J. R. Ritter.
Available from GPO, Washington, D.C. 20402, Price 50 cents (paper copy), Stock No 2401-1142, Geological Survey Water-Supply Paper 1986, 1971. 70 p, 33 fig, 9 tab, 29 ref.

Descriptors: *Sediment transport, *Erosion, *Turbidity, *Floods, *California, River basins, Watershed management, Rainfall-runoff relationships, Geology, Soils, Vegetation, Land use, Topography, Hydrologic data, Data collections, Fluvial sediments, Flood damage, Particle size, Hydrographs.
Identifiers: *Eel River Basin (Calif).

The Eel River in California has the highest recorded average annual suspended-sediment yield per square mile of drainage area of any river of its size or larger in the United States. This yield, in tons per square mile, is more than 15 times that of the Mississippi River and more than four times that of the Colorado River. Sediment-discharge data were collected at 22 locations within the basin for various periods between 1955 and 1967. Average annual rainfall in the basin is about 59 inches, and average annual runoff is about 35 inches. Most runoff occurs during and shortly after the late fall and winter storms. Emphasis is given to catastrophic flooding and record sediment discharges. Floods in December 1964 and January 1965 caused a suspended-sediment discharge of 160 million tons in a 30-day period at Eel River at Scotia. This was about 51% of the suspended load computed for the entire 10-year period at that station. During this same flood period, record suspended-sediment discharges occurred at all sediment stations along the Eel River and its tributaries. Turbidity and the concentration of suspended sediment at several stations in the Eel River basin follow a linear relation which persists throughout the range of measured values of these two variables. (Woodard-USGS)
W72-08504

USE OF TIME-LAPSE PHOTOGRAPHY EQUIPMENT FOR HYDROLOGIC STUDIES,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07B.
W72-08507

ENVIRONMENTAL GEOMORPHOLOGY.
For primary bibliographic entry see Field 04C.
W72-08510

DEBRIS AVALANCHES-A GEOMORPHIC HAZARD,
Geological Survey, Arlington, Va.
G. P. Williams, and H. P. Guy.
In: Environmental Geomorphology, Proceedings of 1st Annual Geomorphology Symposia Series, held at Binghamton, N Y, Oct 16-17, 1970: State University of New York at Binghamton, Publications in Geomorphology, p 25-46, August 1971. 5 fig, 2 tab, 26 ref.

Descriptors: *Landslides, *Debris avalanches, *Virginia, Mass wasting, Mudflows, Rain, Soil erosion, Geomorphology, Appalachian Mountain region.

A torrential rainfall on August 19-20, 1969 in central Virginia caused widespread debris-avalanching on mountainsides. Measurements and a description of the avalanche scars are given with the factors associated with the occurrence of these debris-avalanches. Pre-existing depressions on the hillside and the aspect of hillside (N-, NE- and E-facing slopes) were associated with the most intensive avalanching. Most debris avalanches occur during the summertime. Due to their magnitude and estimated frequency they are probably a very important erosional process on mountain hillsides in the eastern United States. Much but not all of the social and economic damage resulting from debris avalanches can be prevented by careful planning. (See also W72-08510) (Knapp-USGS)
W72-08512

FORMS AND CYCLES IN BEACH EROSION AND DEPOSITION,
Columbia Univ., New York. Teachers Coll.
W. E. Yasso.
In: Environmental Geomorphology, Proceedings of 1st Annual Geomorphology Symposia Series, held at Binghamton, N Y, Oct 16-17, 1970: State University of New York at Binghamton, Publications in Geomorphology, p 109-137, August 1971. 1 fig, 2 plate, 42 ref. NR 388-057 ONR Contract N-ONR266 (68).

Descriptors: *Beach erosion, *Beaches, *Geomorphology, *Surf, *Waves (Water), Seasonal, *New Jersey, Sedimentation, Ocean waves, Shore protection, Tidal effects, Sand bars.
Identifiers: *Sandy Hook (NJ).

Ocean beaches respond to a seasonal cycle of winter cut and summer fill induced by the higher tides, larger waves, and greater steepness of waves during the winter season and more

moderate conditons during the summer season. Shorter term cycles also operate and include a semi-daily cycle of cut and fill associated with tidal rise and fall on equilibrium beaches at Sandy Hook, New Jersey. This beach has foreshore spit-bars which are attached to land, with a distal terminus in deep water. Plan curvature of spit-bars is convex toward open water. During rising tide, waves generated in Sandy Hook Bay erode the seaward face of the lower-foreshore spit-bar, which migrates landward. An annual cycle of spit-bar formation is the result of an annual cycle of prevailing wind. In winter, large waves erode the eeder beach. This sediment is deposited along the spit-bar shoreline. In summer, small, low waves from the south push this sediment into a succession of landward-migrating lower-foreshore spit-bars that merge to form a new upper-foreshore spit-bar by the end of the summer. Computers were programmed to test and quantify the assumed curvature resulting from wave refraction. All 21 lines of curvature from a succession of foreshore spit-bars were closely approximated by log-spiral curves. (See also W72-08510) (Knapp-USGS)
W72-08514

IMPACT OF HIGHWAYS ON THE HYDROGEOLOGIC ENVIRONMENT,
Pennsylvania State Univ., University Park. Coll. of Earth and Mineral Sciences.
For primary bibliographic entry see Field 04C.
W72-08516

SUMMARY OF ANNUAL WAVE POWER FOR TEN DEEP WATER STATIONS ALONG THE CALIFORNIA, OREGON AND WASHINGTON COASTS,
California Univ., Berkeley. Coll. of Engineering.
For primary bibliographic entry see Field 07C.
W72-08520

AN EXPERIMENTAL STUDY OF HEAVEY MINERAL SEGREGATION UNDER ALLUVIAL--FLOW CONDITIONS,
Geological Survey, Fort Collins, Colo.
L. L. Brady, and H. E. Jobson.
Geological Survey Open-file Report, March 1972. 137 p, 24 fig, 7 tab, 38 ref, 4 append.

Descriptors: *Mineralogy, *Aluvium, *Sands, *Sediments, *Rio Grande River, *New Mexico, Analytical techniques, Sampling, Flumes, Sediment transport, Particle size, Bed load, Data collections, Exploration, Separation techniques, Seive analysis.
Identifiers: *Heavy minerals, Ilmenite, Magnetite, Bed material, Research project, *Bernardo (N Mex).

Segregation of opaque minerals (mainly ilmenite and magnetite) from the light minerals in a natural sand was observed in a large (61 x 2.44 x 1.22 meters) recirculating water-sediment flume. Bed material (median size 0.286 millimeters) used in the study was taken from the Rio Grande near Bernardo, N. Mex. Opaque heavy minerals (median size 0.144 millimeter) present in the bed material comprised 0.38% of the bed load material volume. Significant hydraulic variables, and sorting and bedding patterns of the bed material, were observed for four different bed configurations: a flat bed (upper flow regime), a transition bed, and two different dune beds (lower flow regime). Accumulations of opaque heavy minerals were formed as three basic types: (1) thin accumulations of opaque heavy minerals covering small areas that were associated with the upstream or stoss slopes of dunes; (2) accumulations associated with the top-set deposits of large dunes and with dunes formed in the transition flow; and (3) accumulation associated with the flat-bed condition. The most important factors influencing the type and amount of accumulation of opaque heavy minerals were bed configuration and grain density. (Woodard-USGS)
W72-08525

ASPECTS OF THE TEXTURE AND MINERALOGY OF SURFICIAL SEDIMENTS, HORRY AND MARION COUNTIES, SOUTH CAROLINA,
Australian National Univ., Canberra. Dept. of Biogeography and Geomorphology.
B. G. Thom, R. D. Adams, C. J. Cazeau, and S. D. Heron, Jr.
Southeastern Geology, Vol 14, No 1, p 39-58, March 1972. 9 fig, 4 tab, 17 ref.

Descriptors: *Mineralogy, *Sedimentation, *Provenance, *South Carolina, *Atlantic Coastal Plain, Deposition (Sediments), Sediment sorting, Particle size, Soil formation, Sediments, Beaches, Dunes, Sedimentology.
Identifiers: *Horry County (S C), *Marion County (S C).

Sedimentary deposits in Horry and Marion Counties, South Carolina offer an ideal situation for the study of sediment mixing by both marine and fluvial processes. Size properties, mineralogy of the sand and clay fractions, and aspects of the weathering profiles were used to infer the contribution from Piedmont and Coastal Plain sources. When abundance of heavy minerals is compared with mean size of sampled sediment there is a strong association in samples collected in the river valleys, particularly for epidote and hornblende. This may reflect mixing above the study area for fluvial sediments, and mixing within the area for the deposition of barrier sediments. The older the coastal barrier the more the stable heavy minerals such as zircon and staurolite tend to dominate. Clay mica is most abundant in back barrier flat sediments. Weathering profiles are important in the consideration of size and mineral assemblage relations. In addition to the variation of total iron, the degree of weathering also influences the grain size configuration of the A2 horizon and the stability of the mineral assemblage. (Knapp-USGS)
W72-08528

SHORE PROTECTION GUIDELINES, A PART OF THE NATIONAL SHORELINE STUDY.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-08539

ACTIVATION ANALYSIS AS A METHOD FOR TRACING SUSPENDED SEDIMENTS,
Puerto Rico Nuclear Center, Mayaguez.
For primary bibliographic entry see Field 05B.
W72-08549

THE OXYGEN UPTAKE DEMAND OF RESUSPENDED BOTTOM SEDIMENTS,
Seattle Univ., Wash. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02K.
W72-08569

CURRENTS AND DIFFUSION OF LAKE BAIKAL WATERS (TECHENIYA I DIFFUZIYA VOD BAYKALA).
Limnologicheskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 02H.
W72-08710

VERTICAL DISTRIBUTION OF ORGANIC--MATTER DECOMPOSITION PRODUCTS IN BOTTOM SEDIMENTS (O VERTIKAL'NOM RASPREDELENII PRODUKTOV RASPADA ORGANICHESKOGO VESHCHESTVA V DONNYKH OTLOZHENIYAKH),
Limnologicheskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 02H.
W72-08715

DISTRIBUTION OF MULTISTAGE DECOMPOSITION PRODUCTS OF ORGANIC MATTER IN BOTTOM SEDIMENTS (O RASPREDELENII PRODUKTOV MNOGOSTADIYNOGO RASPADA ORGANICHESKOGO VESHCHESTVA V DONNYKH OTLOZHENIYAKH),
Limnologicheskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 02H.
W72-08716

SEDIMENT TRANSPORTATION MECHANICS: FUNDAMENTALS OF SEDIMENT TRANSPORTATION.
American Society of Civil Engineers, New York. Task Committee for Preparation of the Sedimentation Manual.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 97, No HY12, p 1979-2022, Dec 1971. 26 fig, 2 tab, 79 ref, append.

Descriptors: *Sediment transport, *Sedimentation, *Sediment discharge, Sediments, Sediment load, Bibliographies, Bed load, Dunes, Streambeds, Alluvial channels, Water temperature, Suspended sediments, On-site tests.
Identifiers: *Bed forms, Size frequency distribution, Sediment deposits, Bed load movement, Streambed profiles, *Alluvial streams, Bed ripples.

Data from field and laboratory investigations of sedimentation problems are presented and compared to clarify some of the characteristics of alluvial streams. When possible, data are compared with theoretical results. In the first section, pertinent variables governing sediment transportation and a discussion of the problem of selecting dependent and independent variables are given. Bed forms are discussed theoretically; data on bed forms in streams are given. Basic concepts underlying the theories of sediment transportation are discussed and some observed relationships not explained by these theories are presented. Data and ideas on the comparative sizes of bed sediment and sediment load are presented and discussed in light of streambed armoring. The final section describes effects of water temperature on sediment movement. Information presented will become a part of a chapter on mechanics of the proposed publication on Sedimentation Engineering being prepared by a task committee. (USBR)
W72-08744

THE DEVELOPMENT OF LAKE PHYAEJAERI IN SOUTHERN FINLAND CONSIDERING SEDIMENT AND DIATOM STUDIES,
Institute of Technology, Otaniemi (Finland). Geologiska Institutionen.
For primary bibliographic entry see Field 02H.
W72-08751

UPTAKE OF COBALT FROM SEAWATER BY AEOLIAN DUST,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 02K.
W72-08802

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 7 AND 8. LOWER MISSISSIPPI RIVER BASIN AND WESTERN GULF OF MEXICO BASINS.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08805

THE EFFECT OF MOISTURE ON SLOPE STABILITY: A CLASSIC EXAMPLE FROM SOUTHERN ALBERTA, CANADA,
Lethbridge Univ. (Alberta). Dept. of Geography.
C. B. Beaty.
Journal of Geology, Vol 80, No 3, p 362-366, May 1972. 3 fig, 6 ref.

Descriptors: *Mass wasting, *Infiltration, *Degradation (Slope), Landslides, Canada, Creep, Slope stability, Slopes.
Identifiers: *Slump, Alberta (Canada).

The effect on slope stability of a geologically rapid increase in moisture content is described. The wall of a coulee in southern Alberta underlain by glacial debris, and probably stable during much of postglacial time, was recently activated by infiltration from an irrigation ditch; in only 8 years it has developed impressive landsliding of the slump variety. Numerous large tension cracks have formed on the irregular, blocky surface of the slump since 1969, assuring that water from melting snow and rain has, and for a long time will continue to have, direct and ready access to its interior, thus accentuating and perpetuating the condition of instability. Motion continues at a discernible rate, as indicated by sporadic buckling and displacement of the road at the base of the slope; most recently, part of the toe of one lobe moved about 0.15 m (6 inches) in July 1971 during a 24-hour period following a heavy rain. (Knapp-USGS)
W72-08811

IRON-RICH BASAL SEDIMENTS FROM THE EASTERN EQUATORIAL PACIFIC: LEG 16, DEEP SEA DRILLING PROJECT,
Ottawa Univ. (Ontario). Dept. of Geology.
D. S. Cronan, T. H. van Andel, G. R. Heath, M. G. Dinkelman, and R. H. Bennett.
Science, Vol 175, No 4017, p 61-63, January 7, 1972. 1 fig, 1 tab, 10 ref.

Descriptors: *Marine geology, *Sedimentology, *Test wells, *Cores, *Pacific Ocean, Deposition (Sediments), Bottom sediments, Sampling, Structural geology, Tertiary period.
Identifiers: *Ferruginous sediments, Deep-Sea Drilling Project, East Pacific Rise.

Iron-rich sediments from drill holes described in this report are chemically similar to sediments forming today on the crest of the East Pacific Rise. The ferruginous sediments, found just above basement at widely separated drill sites of Leg 16 of the Deep Sea Drilling Project, are probably the Tertiary equivalent of those forming at present. Eighteen samples of basal and near basal sediments from sites 159 through 162 were selected for analysis, together with two shallower samples from site 159 and 160 for comparison. The results of the analysis are presented on a carbonate-free basis. According to current theories of sea-floor spreading, new ocean floor moves away from ridge crests and carries away the sediment deposited on it irrespective of its origin. Sediments from the drill holes were probably formed when the basement was at the crest of the East Pacific Rise and have moved to their present location as a result of sea-floor spreading. (Lang-USGS)
W72-08815

LANDSCAPE OF NORTHERN GREENLAND,
Geological Survey, Arlington, Va. Military Geology Branch.
For primary bibliographic entry see Field 02C.
W72-08822

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: TREYNOR, IOWA,
Agricultural Research Service, Council Bluffs, Mo.
For primary bibliographic entry see Field 02B.
W72-08908

AN INTERPRETATION OF RESERVOIR SEDIMENTATION: 1. EFFECT OF WATERSHED CHARACTERISTICS,
Purdue Univ., Lafayette, Ind. Agriculture Experiment Station.
M. Paulet, H. Kohnke, and L. J. Lund.
Journal of Environmental Quality, Vol 1, No 2, p 146-150, April-June 1972. 5 fig, 2 tab, 11 ref.

Descriptors: *Sedimentation, *Reservoir silting, *Sediment yield, *Provenance, Silting, Deposition (Sediments), Sedimentology, Silts, Organic matter, Sediment transport, Erosion, Soil erosion, Illinois, Particle size, Density, Indiana, Statistics.

The value of a water storage reservoir can decrease rapidly if its capacity is reduced by settling of eroded and suspended soil. Many factors determine the rate of this siltation. To what extent the influence of the characteristics of the soils of the contributing watershed upon rate and type of sedimentation of reservoirs can be assessed quantitatively, and how these effects are correlated with other geomorphological factors are discussed. In 14 reservoir-watershed combinations in Indiana and Illinois, the majority of the soils were silt loams. As the mean particle size decreased and the more uniform their particle size, the greater were the sedimentation rates. Sediment density was a function of particle size and organic matter content. The larger the mean particle size and the smaller the organic matter content, the greater the bulk density. The variation of sediment particle size and sedimentation rates were functions of geomorphological and pedologic watershed characteristics. (Knapp-USGS)
W72-08948

COMPUTER SIMULATION MODEL OF COASTAL PROCESSES IN EASTERN LAKE MICHIGAN,
Williams Coll., Williamstown, Mass.
For primary bibliographic entry see Field 02H.
W72-08991

EARTHFLOWS IN THE GRONDINES AND TROIS RIVIERES AREAS, QUEBEC,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
P. F. Karrow.
Canadian Journal of Earth Sciences, Vol 9, No 5, p 561-573, May 1971. 7 fig, 1 tab, 36 ref.

Descriptors: *Landslides, *Mudflows, *Clays, *Slope stability, Mass wasting, Soil erosion, Valleys, Radioactive dating, Carbon radioisotopes, Soil strength.
Identifiers: *Quebec, *St. Lawrence River valley.

Extra-sensitive or quick clays are characteristic deposits of the Champlain Sea, which covered the St. Lawrence River valley about 11,000 years ago. Landslides of the earthflow type occur along many of the stream valleys. Rapid dissection and high precipitation are commonly associated with earthflows. Landforms characteristic of earthflows include bowls, slump slice ridges, pinnacles, inter-bowl ridges, and ribbing. Large earthflow complexes cover areas of several square miles, particularly just south of the St. Narcisse moraine. Earthflow debris spreads over alluvial deposits, many of which contain datable plant matter. Only a few prehistoric earthflows have been radiocarbon dated, but such data hold promise for the study of alluvial history and earthflow occurrence. At least two consecutive phases of earthflow activity occurred in some areas, over a time span of several thousand years. Earthflows tend to occur in groups; historic flows in the area, including the classic St. Thuribe slide, have occurred in close proximity to older slides. Therefore certain slide-prone areas can be designated for planning purposes. It is advisable to avoid having building sites near present stream valleys. (Knapp-USGS)
W72-09002

RELICT PERMAFROST MICRORELIEF IN THE UPPER VOLGA BASIN,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 02C.
W72-09008

RELATION BETWEEN TITANIUM AND IRON IN SEDIMENTS OF THE INDIAN OCEAN (TITAN I SOOTNOSHENIYE YEGO S ZHELEZOM V OSADKAKH INDIYSKOGO OKEANA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
A. B. Isayeva.
Geokhimiya, No 3, p 310-317, March 1971. 4 fig, 6 tab, 17 ref.

Descriptors: *Geochemistry, *Titanium, *Iron, *Indian Ocean, *Sediments, Bottom sediments, Sedimentation, Lithification, Rocks, Metals, Manganese, Moisture content, Depth, Cores.
Identifiers: *USSR, *Arabian Sea, *Bay of Bengal, Nodules, Pelagic, Terrigenous.

Core samples collected from northern and central areas of the Indian Ocean were examined for titanium distribution. The average titanium content in the surface layer of sediments is 0.25% and in the cores, 0.31%. The highest concentration of titanium (0.34%) was found in the surface layer of bottom sediments in the Bay of Bengal. Titanium contents in sediments of the Arabian Sea and central ocean area are practically the same and average 0.21% and 0.20%, respectively. During sedimentation, titanium is closely associated with iron, and the Fe/Ti ratio describes the behavior of titanium during different stages of the process. Within sediments of the central ocean area, titanium accumulates more rapidly than iron. The rate of titanium accumulation is less in sediments of the central band than in sediments of the Arabian Sea and Bay of Bengal. The titanium content in sediments of all regions increases with depth and degree of sediment compaction. The inverse relation between titanium and moisture contents of sediments attests to titanium accumulation during lithification. (Josefson-USGS)
W72-09009

EXPERIMENT IN THE MATHEMATICAL DESCRIPTION OF THE FORM OF LONGITUDINAL RIVER PROFILES,
Kazan State Univ. (USSR).
For primary bibliographic entry see Field 02E.
W72-09010

MUDFLOWS, (SELI),
S. M. Fleyshman.
Gidrometeoizdat, Leningrad, 1970. 352 p.

Descriptors: *Mudflows, *Landslides, *Settling basins, *Deposition (Sediments), Sediment distribution, Sediment transport, Sediment discharge, Sediment load, Sediment control, Warning systems, Forecasting, Hydrology, Hydraulic engineering, Geomorphology, Land management, Forest management, Investigations, Aerial photography, Classification, History.
Identifiers: *USSR.

This four-part monograph presents the results of Soviet research on mudflows and the methods of their investigation, classification, prevention, and control. The formation, movement, deposition, and distribution of mudflows are examined in connection with hydrologic and hydraulic calculations of mudflow parameters and prediction of mudflow phenomena. Applications of geomorphic principles to hydrology and engineering projects are reflected in soil conservation measures to protect agricultural and forest lands, and in hydraulic construction to control mudflows in developed areas. (Josefson-USGS)
W72-09011

ROLE OF TECTONIC AND CLIMATIC FACTORS IN DEVELOPMENT OF TERRACES OF THE DNESTR VALLEY,
D. N. Afremov.
Geomorphology, No 4, p 317-326, October-December 1970. 4 fig, 23 ref. (Translated from Geomorfologiya, No 4, p 51-62, October-December 1970).

Descriptors: *Geomorphology, *Valleys, *Terraces (Geologic), Surfaces, Alluvium, Flood plains, Deposition (Sediments), Aggradation, Erosion, Degradation (Stream), Equilibrium, Water levels, Geologic time, Pleistocene epoch, Recent epoch, Glaciation, Climatology.
Identifiers: *USSR, *Ukraine, *Dnestr River, *Tectonics, Pliocene epoch, Stream capture.

The terraces of the Dnestr River valley in the western Ukraine are divided into 3 stages: an upper stage of Late Pliocene age, and middle and lower stages of Pleistocene age. The upper stage includes two terraces: the sixth (the Loev surface) and the fifth, which is the oldest valley terrace of the Dnestr. The middle stage consists of the third and fourth terraces, which merge into a single level in upstream reaches of the Strui River. The lower stage includes the first and second terraces and the floodplain upstream from the Bystritsa Tys'menskaya River, where the first terrace is weakly expressed. During the first half of the Late Pleistocene, the valley was subjected to severe erosive processes. The extent of erosional downcutting between the upper and middle stages was 2-4 times greater than between the middle and lower stages. In the Holocene, the difference in rate of uplift of the Opol'e and Carpathian reaches was small, as evidenced by the gradual wedging out of the first terrace in the Carpathian reach and by the higher position of the floodplain base in the Opol'e reach. (Josefson-USGS)
W72-09014

A CATASTROPHIC MUDFLOW IN TADZHIKISTAN (AROUND THE VILLAGE OF YALDOMYCH),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
V. M. Muratov, and E. A. Fin'ko.
Geomorphology, No 4, p 333-335, October-December 1970. 2 fig. (Translated from Geomorfologiya, No 4, p 70-73, October-December 1970).

Descriptors: *Geomorphology, *Mudflows, *Mud, Debris avalanches, Landslides, Slopes, Rocks, Boulders, Precipitation (Atmospheric), Seismic waves, On-site investigations.
Identifiers: *USSR, Tadzhikistan.

Field investigations were conducted in the Yaldomych River valley near Garm in Tadzhikistan following the catastrophic mudflow which destroyed part of the village of Yaldomych on the morning of May 31, 1969. The purpose of the investigations was (1) to determine the cause of the mudflow; (2) to reconstruct the process of its development; and (3) to predict the possibility of a repetition of mudflow activity in the area. The collapse that caused the mudflow involved the entire southern slope of the Kabud-Krym Range, beginning at an elevation of 1,900 m (relative height of the slope, about 120 m). The fine soils on the slope were stripped away to depths of 8-12 m. The initial volume of loose material set into motion was of the order of 100,000 cu m. Debris flow in the stream channel was a flow of mud, and that in the village, a flow of mud and rock. Protracted rains and seismic shocks like those associated with this collapse could readily produce more mudflows similar to the one described. (Josefson-USGS)
W72-09015

FIELD TESTS OF PUMPING-TYPE SEDIMENT SAMPLERS,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
N. H. Welch, P. B. Allen, and E. D. Rhoades.
Transactions of the American Society of Agricultural Engineers, Vol 14, No 6, p 1122-1125, 1971. 4 fig, 1 tab, 8 ref.

Descriptors: *Calibration, Regression analysis, Least squares method, *Suspended load, *Sediment discharge, Instrumentation, Automation, Correlation analysis, Sediment distribution, Sediment yield, *Sampling, *On-site tests, Soil density probes.
Identifiers: Pumping-type sediment samplers, Automatic sediment samplers, *Sediment concentration, Sediment samples.

The sediment concentration of samples collected at a point in the stream by the pumping-type sediment samplers was compared to the cross-sectional sediment concentration obtained by the depth-integration method. The relationship between depth-integrated and the corresponding pump sample concentration was determined by least squares analysis. The correlation coefficient, regression equation, and standard error of estimate at 12 gaging stations are presented. Estimates of cross-sectional sediment concentration using pump sample data were accurate enough for most applications except at two gaging stations where a high percent of sand was carried in suspension. At these two gaging stations, it was difficult to locate a point in the stream where there was a good correlation between pump sample and cross-sectional concentration. The samplers must be calibrated at each location but they save much of the time and labor normally required to collect manual samples.
W72-09063

2K. Chemical Processes

EQUILIBRIUM DISTRIBUTION OF SMALL ORGANIC MOLECULES IN NATURAL WATERS,
Southern Methodist Univ., Dallas, Tex. Dept. of Geological Sciences.
For primary bibliographic entry see Field 05B.
W72-08501

THE OCCURRENCE OF ALKANES IN FULVIC ACID, A SOIL HUMIC FRACTION,
Department of Agriculture, Ottawa, (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 02G.
W72-08502

GROUND-WATER CONDITIONS DURING 1970 IN INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W72-08505

BIBLIOGRAPHIES IN NUCLEAR SCIENCE AND TECHNOLOGY. SECTION 14. ACTIVATION ANALYSIS,
Zentralstelle fuer Atomkernenergie-Dokumentation, Frankfurt on Main (West Germany).
For primary bibliographic entry see Field 05A.
W72-08543

TRACE METAL ASSOCIATIONS IN SUB-ARCTIC AND ARCTIC MARINE ENVIRONMENTS. WORK IN PROGRESS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05A.
W72-08550

TRACE ELEMENTS IN NATURAL WATERS, ANNUAL PROGRESS REPORT, DECEMBER 1, 1970 - NOVEMBER 30, 1971,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 05A.
W72-08551

THE OXYGEN UPTAKE DEMAND OF RESUSPENDED BOTTOM SEDIMENTS,
Seattle Univ., Wash. Dept. of Civil Engineering.
R. H. Berg.
Environmental Protection Agency, Water Pollution Control Research Series 16070 DCD, September 1970. 38 p. 11 fig, 6 tab, 15 ref.

Descriptors: *Measurement, *Biochemical oxygen demand, *Bottom sediments, *Suspended solids, Turbulence, Light, Temperature, Estuaries, Dissolved oxygen.
Identifiers: *Warburg respirometer, Bellingham Bay (Wash).

The Warburg respirometer was used to evaluate the influence of light, sodium chloride, dilution salts, temperature, and agitation on the maximum oxygen uptake of disturberd estuarian benthos material. Temperature varied from 10 to 20C and the agitation settings from maximum to 25%. The variations in the initial uptake ranged from 2000 to 83,000 mg/1 of oxygen/hr. Agitation alone caused a ten-fold increase in the maximum oxygen demand. (Wilde-Wisconsin)
W72-08569

THE CHEMICAL EXCHANGE CAPABILITIES OF THE BATON ROUGE GROUND-WATER SYSTEM,
Louisiana Water Resources Research Inst., Baton Rouge.
J. S. Hanor.
Available from the National Technical Information Service as PB-209 533. Louisiana Water Resources Research Institute, Completion Report, April 17, 1972. 14 p, 2 fig, 7 ref. OWRR A-025-LA (1).

Descriptors: *Ion exchange, *Cation adsorption, *Water softening, *Aquifers, Injection, Water supply, *Louisiana, *Groundwater.
Identifiers: *Baton Rouge (La).

A preliminary study was made of the chemical exchange capabilities of the Baton Rouge groundwater system. Such information is necessary to evaluate the potential of the system for the controlled modification of water quality. All available analyses of subsurface waters in the area were digitized, and a series of computer programs were written for the thermodynamic evaluation and classification of the waters. This work has shown that the aquifers constitute a dynamic system which has reacted and evolved in composition as water has been withdrawn. For example, the maximum Na/K ratio of fresh waters in deep aquifers has increased by over an order of magnitude in the last 30 years. Study of subsurface logs has shown that considerable variation exists in the spatial distribution of potential exchange sites within the aquifers. The 2400-foot aquifer may be particularly suited for the controlled modification of water quality because of its abundant intercalated clay lenses. This work is directed toward a fuller understanding of the reaction kinetics and exchange potential of the system.
W72-08589

AN AUTOMATED SYSTEM FOR MULTIPLE RECORDING OF DIURNAL PH,
Battelle Memorial Inst., Richland, Wash.
For primary bibliographic entry see Field 07B.
W72-08603

A PORTABLE FLOW-CELL MEMBRANE SALINOMETER,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 07B.
W72-08605

WATER RESOURCES INVESTIGATIONS IN MARYLAND AND THE DISTRICT OF COLUMBIA, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08732

WATER RESOURCES INVESTIGATIONS IN NEBRASKA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08733

PESTICIDES IDENTIFICATION AT THE RESIDUE LEVEL.
For primary bibliographic entry see Field 05A.
W72-08738

UPTAKE OF COBALT FROM SEAWATER BY AEOLIAN DUST,
Liverpool Univ. (England). Dept. of Oceanography.
S. Aston, R. Chester, and L. R. Johnson.
Nature, Vol 235, No 5338, p 380-381, February 18, 1972. 1 tab, 9 ref.

Descriptors: *Cobalt, *Aeolian soils, *Sea water, *Adsorption, Trace elements, Dusts, Sampling, Laboratory tests, Methodology, Sediments, Rivers, Oceans.
Identifiers: Trade winds.

A radio-tracer technique used in experiments to measure Co uptake from seawater by dust from the northeast trade winds is described. Cobalt was used in the studies because it is known to be partially adsorbed from river detritus on contact with a saline environment. Results of earlier experiments had shown that when a trace element is adsorbed from solution in rivers, the element is released on contact with seawater. The methodology is described and data of experimental uptake of cobalt from seawater by the dusts from 11 sample locations are listed. The aeolian dusts removed an average of 70% of the Co (range 60-80%) from seawater within temperature and pH ranges expected in the average 4,000 m deep colume of seawater. Because of inherent difficulties in attempting to reproduce open-sea conditions in the laboratory, no attempt is made to extrapolate these experimental results to processes controlling trace element geochemistry of deep-sea sediments. (Lang-USGS)
W72-08802

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 7 AND 8. LOWER MISSISSIPPI RIVER BASIN AND WESTERN GULF OF MEXICO BASINS.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08805

ATOMIC ABSORPTION SPECTROPHOTOMETRY SIMPLIFIES HEAVY--METALS ANALYSIS,
Chicago Dept. of Water and Sewers, Ill. Water Purification Div.
For primary bibliographic entry see Field 05A.
W72-08807

ANALYSIS OF ENVIRONMENTAL SAMPLES BY SPARK SOURCE MASS SPECTROMETRY--1. TRACE ELEMENTS IN WATER,
Atomic Energy of Canada, Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
For primary bibliographic entry see Field 05A.
W72-08823

GAS CHROMATOGRAPHY VERSUS INFRA-RED SPECTROMETRY FOR DETERMINATION OF MINERAL OIL DISSOLVED IN WATER,
Instituut voor Gezondheidstechnick TNO, Delft (Netherlands).
For primary bibliographic entry see Field 05A.
W72-08824

THERMODYNAMICS OF SOIL WATER: I. THE ENERGY CONCEPT OF SOIL WATER,
National Inst. of Agricultural Science, Tokyo (Japan).
For primary bibliographic entry see Field 02G.
W72-08885

BORON ADSORPTION BY SOILS AS INFLUENCED BY POTASSIUM,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel); and Technion - Israel Inst. of Tech., Haifa.
For primary bibliographic entry see Field 02G.
W72-08890

SOIL AND LEAF NUTRITIONAL STATUS OF COCOA PLANTINGS ON THE EAST AND WEST COASTS OF MALAYA,
Rubber Research Inst. of Malaya, Kuala Lumpur (Malaysia).
For primary bibliographic entry see Field 02G.
W72-08988

CLAY WATER DIAGENESIS DURING BURIAL: HOW MUD BECOMES GNEISS,
Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
For primary bibliographic entry see Field 02G.
W72-08998

RELATION BETWEEN TITANIUM AND IRON IN SEDIMENTS OF THE INDIAN OCEAN (TITAN I SOOTNOSHENIYE YEGO S ZHELEZOM V OSADKAKH INDIYSKOGO OKEANA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W72-09009

DETERMINATION OF TECHNETIUM BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Argonne National Lab., Idaho Falls, Idaho.
For primary bibliographic entry see Field 05A.
W72-09089

GAS-CHROMATOGRAPHIC SEPARATION OF HYDROGEN SULFIDE, AIR, AND WATER,
Lakehead Univ. Thunder Bay (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-09105

ALTERNATING CURRENT AND DIRECT CURRENT POLAROGRAPHY IN CONCENTRATED HYDROFLUORIC ACID SOLUTIONS WITH A TEFLON DROPPING MERCURY ELECTRODE,
Melbourne Univ., Parkville (Australia). Dept. of Inorganic Chemistry.
For primary bibliographic entry see Field 05A.
W72-09106

STANDARD POTENTIAL OF THE COPPER (II)-(I) COUPLE IN ACETONITRILE,
Alberta Univ., Edmonton. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-09107

CONCURRENT SOLUTION AND ADSORPTION PHENOMENA IN GAS-LIQUID CHROMATOGRAPHY-A COMPARATIVE STUDY,
Georgetown Univ., Washington, D.C., Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-09114

GAS CHROMATOGRAPH-MASS SPECTROMETER-ACCELERATING VOLTAGE ALTERNATOR SYSTEM FOR THE MEASUREMENT OF STABLE ISOTOPE RATIOS IN ORGANIC MOLECULES,
Argonne National Lab., Ill. Div. of Biological and Medical Research.
For primary bibliographic entry see Field 05A.
W72-09115

SLOPE ANALYSIS FOR RECOGNITION AND CHARACTERIZATION OF STRONGLY OVERLAPPED CHROMATOGRAPHIC PEAKS,
State Univ. of New York, Buffalo. Dept. of Chemistry.
E. Grushka, and G. C. Monacelli.
Analytical Chemistry, Vol. 44, No. 3, p 484-489, March 1972. 6 fig, 2 tab, 14 ref.

Descriptors: *Chromatography, *Mathematical studies, Spectrophotometry, Electrochemistry, Data collections, Chemical analysis, Methane, Gas chromatography, Computers, Data processing, Equations.
Identifiers: Slope analysis, Extrema ratios, Peak overlap, Chromatography peaks, Heptane, Xylene.

The problems of strongly overlapped double peaks (resolution less than 0.5) and unresolved peaks (appearing as composites below the 'detectability limit') which frequently occur in spectrophotometric, electrochemical, and chromatographic methods of analysis can be resolved by slope analysis in the form of second derivatives extrema ratios. Further, with Gaussian peaks, theory suggests that these extrema ratios can indicate the resolution between 2 peaks in a composite as well as the ratio of their heights, thus completely characterizing the system. To verify these predictions, samples of methane, heptane, and paraxylene were injected at varied time intervals into a chromatographic system to produce simulated double peaks. The data were digitized and computer analyzed. Digitized data were smoothed using a 5 point 3rd order polynomial fitting technique. By differentiating the expression twice, a smoothed 2nd derivative was obtained. The experimental results supported the theoretical predictions. (Mackan-Battelle)
W72-09116

ELECTROLYTIC CALIBRATION TECHNIQUE FOR DISSOLVED NITROGEN DETERMINATION IN SEAWATER BY ON-STREAM STRIPPING GAS CHROMATOGRAPHY,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
For primary bibliographic entry see Field 05A.
W72-09128

ACID INTERFERENCES IN ATOMIC ABSORPTION SPECTROMETRY,
Perkin-Elmer Corp., Norwalk, Conn.
For primary bibliographic entry see Field 05A.
W72-09130

THE DETERMINATION OF ATOMIC ABSORPTION DETECTION LIMITS BY DIRECT MEASUREMENT,
Perkin-Elmer Corp., Norwalk, Conn.
S. Slavin, W. Barnett, and H. L. Kahn.
Atomic Absorption Newsletter, Vol. 11, No. 2, p 37-41, March-April 1972. 4 fig, 1 tab, 7 ref.

Descriptors: *Laboratory equipment, *Evaluation, Instrumentation, Gold, Beryllium, Calcium, Cadmium, Cobalt, Chromium, Cesium, Copper, Iron, Mercury, Potassium, Magnesium, Manganese, Molybdenum, Sodium, Nickel, Phosphorus, Lead, Strontium, Titanium, Zinc, Elements (Chemical), Flame photometry, Statistical methods.
Identifiers: *Detection limits, *Atomic absorption spectrophotometry, Precision, Graphite furnace, Atomic absorption spectrophotometers, Silver, Arsenic, Boron, Barium, Bismuth, Dysprosium, Erbium, Europium, Gallium, Gadolinium, Germanium, Holmium, Indium, Iridium, Lanthanum, Lithium, Lutetium, Niobium, Neodymium, Osmium, Palladium, Praseodymium, Platinum, Rubidium, Rhenium, Rhodium, Ruthenium, Antimony, Scandium, Selenium, Silicon, Samarium, Tin, Tantalum, Terbium, Tellurium, Thallium, Thulium, Uranium, Vanadium, Tungsten, Yttrium, Ytterbium, Zirconium.

Standard solutions of 67 different elements containing a few tenths of a microgram/ml were used in measuring the detection limits of a single-beam and a double-beam atomic absorption spectrophotometer using flame sampling, and also a flameless Graphite Furnace system. For the work with flames, integrated readings were used exclusively. The low standard and blank solution were aspirated alternately for a minimum of 10 times each. Ten runs were made with the Graphite Furnace, and its detection limits were determined by measuring peak heights of recorder tracings. In each case, the detection limit was equivalent to two standard deviations of a series of measurements of a low concentration. A direct empirical method, which does not involve calculations, was also tried with some success. The disadvantage of this method is that it depends to some degree on coincidence and is therefore not statistically rigorous. The use of integration caused single-beam results to come closer to those of double beam systems than had been the case in the past. The Graphite Furnace is superior to the flame by several orders of magnitude. (Holoman-Battelle)
W72-09131

2L. Estuaries

USE OF TIME-LAPSE PHOTOGRAPHY EQUIPMENT FOR HYDROLOGIC STUDIES,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07B.
W72-08507

SHORE PROTECTION GUIDELINES, A PART OF THE NATIONAL SHORELINE STUDY.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-08539

THE OXYGEN UPTAKE DEMAND OF RESUSPENDED BOTTOM SEDIMENTS,
Seattle Univ., Wash. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02K.
W72-08569

THE FLUX OF PARTICULATE CARBON IN AN ESTUARY,
Maryland Dept. of Research and Education, Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 05C.
W72-08575

GREGARIOUS SETTING IN THE AMERICAN OYSTER CRASSOSTREA VIRGINICA GMELIN: I. PROPERTIES OF A PARTIALLY PURIFIED 'SETTING FACTOR',
Maryland Univ., College Park. Dept. of Chemistry; and Maryland Dept. of Research and Education, Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 08I.
W72-08580

RELATIONSHIPS OF AUTOTROPHIC AMMONIUM-OXIDIZING BACTERIA TO MARINE SALTS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 05C.
W72-08583

THE RESPONSE TO TIDAL FLUCTUATIONS OF TWO NON-HOMOGENEOUS COASTAL AQUIFER MODELS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 02F.
W72-08585

THE MOVEMENTS OF OYSTERCATCHERS HAEMATOPUS OSTRALEGUS L. VISITING OR BREEDING IN THE BRITISH ISLES,
Ministry of Agriculture, Fisheries and Food, Conway (Wales). Fisheries Experiment Station.
P. J. Dare.
Fish Invest Min Agr Fish Food Gt Brit Ser II Salmon Freshwater Fish. 25 (9): 1-137. 1970. Illus.
Identifiers: Breeding, British, Cardium-Edule, Haematopus-Ostralegus, Isles, Movements, Mytilus-Edulis, Oystercatchers, Predation.

This study forms part of a programme of research into problems of reducing losses among stocks of the edible lamellibranchs Cardium edule and Mytilus edulis due to predation by large migrant and winter flocks of oystercatchers. The movements of birds frequenting major shellfish-producing areas in Wales and north-west England were investigated over 5 yr by ringing and color-banding, and the results analysed in conjunction with pullus and other recoveries data already available from European ringing schemes. A complex migration pattern in the area of the British Isles is indicated. The British coasts, and especially those around the Irish Sea, form the main wintering zone of the large 'Atlantic populations' breeding in Iceland, the Faeroe Islands and the British Isles. The 'Continental populations' - chiefly those breeding in the Baltic region and Low Countries, winter almost exclusively along the European seaboard from the Heligoland Bight to south-western Iberia. Comparatively few Continental birds visit the British Isles, and those come predominantly from Norway. The autumnal influx of northern birds into the British Isles begins in late July and coincides with a predominant south to south-westerly post-breeding shift, largely within these islands, of Scottish and many other native breeders. Few adult British oystercatchers emigrate, whereas many 1st-autumn youngsters depart to western France and Iberia. Immatures remain in the wintering areas until 3 or 4 yr old, when they generally return to the vicinity of the birth-place to breed. Adults often home to the same territory, and hence re-mate with the same partner, for a number of years. Evidence from ringing and color-banding suggests that, at least in the 5 areas studied, many adults likewise tend to home each autumn to, and then remain within, specific wintering places. The existence in other waders of homing and site attachment behavior in winter is discussed, and it is suggested that fidelity to a particular winter quarters may be normal in the oystercatcher when prey distribution and abundance are more or less stable.--Copyright 1972, Biological Abstracts, Inc.
W72-08594

ECONOMIC EVALUATION OF A SUBTROPICAL BAY FROM THE STANDPOINT OF WATER QUALITY MANAGEMENT,
Hawaii Univ., Honolulu. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06B.
W72-08595

THE SOCIAL AND ECONOMIC SIGNIFICANCE OF RECREATION ACTIVITIES IN THE MARINE ENVIRONMENT,
Wisconsin Univ., Green Bay. Leisure Sciences Collateral.
For primary bibliographic entry see Field 06B.
W72-08599

CHARACTERISTIC FEATURES OF ESTUARINE CIRCULATION AS REPRESENTED IN THE MERSEY ESTUARY,
Liverpool Univ. (England). Dept. of Oceanography.
K. F. Bowden, and R. M. Gilligan.
Limnology and Oceanography Vol 16, No 3, p 490-502. 1971. Illus. Maps.
Identifiers: *Water circulation, England, *Estuaries, *Mersey estuary.

Measurements have been made at a number of stations in the Narrows of the Mersey estuary of the residual, or nontidal, flow and the salinity distribution under a wide variety of conditions. The data have been analyzed in terms of a stratification-circulation diagram as introduced by Hansen and Rattray. In this way the characteristics of the Mersey estuary were compared with those of other estuaries and with the features of Hansen and Rattray's theoretical model. In the central stretch of the Narrows, the density current circulation is highly developed and the advective mode accounts for about 75% of the upstream transfer of salt. Toward both the upstream and downstream ends of the Narrows, beyond which the estuary becomes wider and shallower, the advective transfer becomes less important than the diffusive processes. The value of the stratification-circulation diagram in representing the conditions in an estuary and interpreting them in terms of the underlying processes is confirmed.--Copyright 1972, Biological Abstracts, Inc.
W72-08606

THE FREE AMINO ACIDS IN THE SEDIMENTS OF TORONTO HARBOR,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W72-08608

LIFE HISTORY, ECOLOGICAL PRODUCTION, AND AN EMPIRICAL MATHEMATICAL MODEL OF THE POPULATION OF SAGITTA ELEGANS IN ST. MARGARET'S BAY, NOVA SCOTIA,
Bedford Inst., Dartmouth (Nova Scotia).
D. D. Sameoto.
Journal of the Fisheries Research Board of Canada, Vol 28, No 7, p 971-985, 1971. Illus. Map.
Identifiers: Canada, Distribution, Life history studies, Mathematical models, *Nova Scotia, Population, Production, *Sagitta elegans, *St-Margaret's Bay.

The population of S. elegans Verrill in St. Margaret's Bay, Nova Scotia, was polymodal throughout the year. The modes were distinct enough to be considered as representing subpopulations. Four subpopulations were present in the Bay during the early winter and a 5th subpopulation entered the Bay during the late winter. The growth of the subpopulations was followed through the year and related to the mean water temperature. A mathematical model describing the effect of temperature on development, length of the life cycle, and reproductive potential is presented. The model simulates the effects of temperature on the body length at maturation, ovary length, generation time, and numbers surviving at various body lengths. Predictions are made on the changes in population size due to temperature, and mortality and flushing rate changes. The calorific content of the animals at different stages of the life history are given along with the carbon content of the animals. A yearly ecological production figure is given based on the turnover rates derived from the Allen curve for one of the subpopulations. The significance of the findings is discussed in relation to the geographic distribution of the species.--Copyright 1972, Biological Abstracts, Inc.
W72-08610

AN INTERSTITIAL WATER-SAMPLING RECEPTACLE FOR INTERTIDAL MUD FLATS,
Maine Dept. of Sea and Shore Fisheries, West Boothbay Harbor.
For primary bibliographic entry see Field 07B.
W72-08611

THE EFFECTS OF THERMAL LOADING AND WATER QUALITY ON ESTUARINE PRIMARY PRODUCTION,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 05C.

W72-08706

CLASSIFICATION AND ORDINATION OF BENTHIC SAMPLES FROM BEDEQUE BAY, AN ESTUARY IN PRINCE EDWARD ISLAND, CANADA,
University Coll. of North Wales, Bangor.
R. N. Hughes, and M. L. H. Thomas.
Mar Biol (Berlin). 10 (3): 227-235. 1971. Illus. Map.
Identifiers: Associations, Bay, Bedeque, Benthic, Canada, Classification, Cluster, Computer, Estuary, Island, Mussel, Ordination, Oyster, Prince-Edward, Samples.

An attempt was made to identify the causes of the distribution of benthos within Bedeque Bay using multivariate techniques programed for the computer. Both classification by a hierarchical cluster analysis, and ordination by principal components analysis suggested that a large proportion of the variance in the data was directly or indirectly correlated with a salinity gradient. Classification divided the species into 2 main groups, a in the upper half of the estuary where lower salinities and larger salinity fluctuations occurred, and group b in the lower half of the estuary with a more stable salinity regime. The group b species were further subdivided into those preferring soft mud and those preferring sandier sediments. The group a species were divided into a well-developed oyster association and various sub-groups less strongly associated with oysters. Five principal components were required to account for 50% of the variance in the data. The first axis accounted for 20% of the variance and was shown by a non-parametric test to be correlated with the salinity gradient. Axis II to V could not be interpreted, but possibly represented complex species interactions. By providing hard substrates, and altering the nature of the sediment, oysters and mussels produced conditions suitable for many other species.--Copyright 1972, Biological Abstracts, Inc.
W72-08769

OBSERVATIONS ON THE TIDEPOOL ECOLOGY AND BEHAVIOR OF PERDINIUM GREGARIUM,
Mount San Jacinto Coll., Gilman Hot Springs, Calif.
E. H. Lombard, and B. Capon.
Journal of Phycology, Vol 7, No 3, p 188-194. 1971. Illus.
Identifiers: Aggregations, Behavior, *Ecology, Movement, *Peridinium gregarium, Temperature, *Tide pools.

Dense populations of a new species of dinoflagellate, P. gregarium, were found in a limited number of small rock tidepools on the coast of southern California. The organism is present throughout the year, but during periods of low temperatures and heavy tides it remains on the bottom of the pools in small aggregations. At other seasons P. gregarium leaves the aggregations during the morning hours and collects around the upper surface of small rocks in masses held together by a mucous matrix. Oxygen bubbles accumulated in the matrix eventually float the mass to the surface of the tidepool. During the afternoon or evening, the individuals return to the bottom aggregations leaving the matrix behind. Field and laboratory studies have attempted to define the nature of this organism's tidepool habitat and factors involved in the regulation of its diurnal movements.--Copyright 1972, Biological Abstracts, Inc.
W72-08776

BENTHIC ALGAE IN POLLUTED ESTUARIES,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W72-08804

HYDROLOGY OF THE RICEBORO AREA, COASTAL GEORGIA,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 05B.
W72-08817

BRISTOL HARBOR BREAKWATER, BRISTOL HARBOR, RHODE ISLAND (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 08A.
W72-08843

WATER CONSERVATION BY BARRIER INJECTION,
Nassau County Dept. of Public Works, Long Island, N.Y.
For primary bibliographic entry see Field 05G.
W72-08861

ORGANISMS OF THE HYDROLITTORAL VEGETATION ZONES, (IN FINNISH),
Zoological Station, Tvarminne (Finland).
Kalevi Keynas.
Luonnon Tutkija. 75 (3/4): 106-112. 1971. Illus. English summary.
Identifiers: Algae, Cladophora, Fauna, Flora, Fucus-Vesiculosus, Littoral, Organisms, Red, Vegetation, Zones.

The 4 archipelago zones of southern Finland (coastal, inner archipelago, outer archipelago and sea zones) are described. Irregular fluctuation of the water level and the ice cover are important ecological factors. The vegetation is divided in the zone of filiform algae (Cladophora), the Fucus vesiculosus zone and the zone of the red algae. The flora and fauna of the different zones are described and compared.--Copyright 1971, Biological Abstracts, Inc.
W72-08875

DREDGING DISPOSAL: REAL OR IMAGINARY DILEMMA,
Corps of Engineers, Boston, Mass. New England Div.
For primary bibliographic entry see Field 05B.
W72-08955

PLANNING, THE LAW, AND A QUALITY ENVIRONMENT,
San Francisco Bay Conservation and Development Commission, Calif.
For primary bibliographic entry see Field 06E.
W72-08957

QUANTITATIVE EVALUATION OF WATER QUALITY IN THE COASTAL ZONE BY REMOTE SENSING,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.
W72-08996

FLOW AND CHANNEL DYNAMICS OF RIVERS IN NONTIDAL DELTA REACHES (DINAMIKA POTOKA I RUSLA V NEPRILIVNYKH UST-'YAKH REK),
State Oceanographic Inst., Moscow (USSR).
V. N. Mikhaylov.
Gosudarstvennyy Okeanograficheskiy Institut Trudy, No 102, Moscow, 1971. 260 p.

Descriptors: *Hydrology, *Geomorphology, *Sedimentology, *Deltas, *Rivers, Channels, Channel flow, Channel morphology, Discharge (Water), Water levels, Water level fluctuations, Currents (Water), Winds, Tides, Estuaries, Saline water-freshwater interfaces, Saline water intrusion, Mississippi River, Methodology, Equations.
Identifiers: *USSR, Danube River, Volga River, Delta deposits, Distributary channels.

This monograph examines dynamics of water flow and development of delta stream patterns unaffected by tides. Special emphasis is placed on saline water-freshwater interfaces, flow and channel processes in a river mouth, and on the quantitative relations which exist between different hydrologic-morphometric characteristics of delta distributaries. Methods are given for calculating and predicting hydrologic-morphometric characteristics of delta reaches for investigation of the effect of physiographic conditions and human activities on the processes occurring in river mouths and for examination and utilization of the natural resources of a delta environment. (Josefson-USGS)
W72-09012

DETERMINATION OF A NITROGEN--PHOSPHORUS BUDGET FOR BAYOU TEXAR, PENSACOLA, FLORIDA,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 05C.
W72-09087

DESCRIPTION AND FUNCTIONAL CLASSIFICATION OF ESTUARIES FOUND IN THE PACIFIC NORTHWEST,
Washington Univ., Seattle. Dept. of Oceanography.
A. C. Duxbury.
Available from the National Technical Information Service as CONF-701064-2, $3.00 in paper copy, $0.95 in microfiche. Report RLO-1725-185, presented at Nearshore and Estuarine Zone Symposium, Portland, Ore. Oct 1970. 8 p. Contract AT (45-1)-1725.

Descriptors: *Estuaries, *Mixing, *Classification, Saline water-freshwater interfaces, Destratification, Columbia River, Pacific Coast Region, Pacific Northwest U.S., Dimensional analysis, Fluid mechanics.

Why dredging, bulkheading and the like may have far-reaching effects is shown qualitatively by the flow-characteristic classification: (A) a sharp interface between the inward-moving salt water and outward-moving surface water is maintained by the current shear (as with the Columbia River and most coastal rivers that do not empty into large embayments), (B) the boundary between the intruding salt water and the outward-flowing surface water is more diffuse because of vertical mixing promoted by tidal turbulence (Grays Harbor, Willipa Bay, and Puget Sound as a total system), (C) the surface between the inflowing and outflowing water intersects the sea surface such that turbulent vertical mixing is extreme, (D) cross-channel as well as vertical mixing (Tacoma Narrows in Puget Sound). Attempts at more quantitative classification are beginning but require conservatism. (Bopp-ORNL)
W72-09088

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, LOUISIANA: PHASE I, AREA DESCRIPTION AND PHASE IV, BIOLOGY,
Louisiana Wild Life and Fisheries Commission, New Orleans.
W. S. Perret, B. B. Barrett, W. R. Latapie, J. F. Pollard, and W. R. Mock.
Available from the National Technical Information Service as COM-72-10051, $3.00 in paper copy, $0.95 in microfiche. 1971. 218 p, 17 fig, 64 tab, 119 ref.

Descriptors: *Estuaries, *Gulf of Mexico, *Systematics, *Louisiana, Coasts, Volume, Vegetation, Discharge (Water), Marine fish, Streamflow, Fisheries, Water pollution, Domestic wastes, Industrial wastes, Biochemical oxygen demand, Plankton, Invertebrates, Sampling, Nets, Biological communities, Water quality, Distribution patterns, Biomass, Aquatic populations, Silversides, Amphipoda, Elasmobranchs, Copepods, Sea basses, Yellow bass, Perches, Drums, Larvae, Mullets, Mississippi River, Sewage, Navigable waters, Zooplankton, Herrings, Catfishes, Eels, Bass, Shrimp, Clams, Pink shrimp, Crabs, Crustaceans, Turtles, Salinity, Water tempera-

ture, Dinoflagellates, Water analysis, Estuaries, Sharks, Isopods, Killifishes, Pyrrophyta.
Identifiers: *Lake Borgne, *Bartaria Bay, *Terrebonne Bay, *Timbalier Bay, *Caillou Bay, *Four League Bay, Carcharias taurus, Pristis pectinatus, Sawfish, Dasyatis sabina, Stingrays, Lepisosterus spatula, Elops saurus, Lody fish, Alosa chripochloris, Brevoortia, Patronus, Menhaden, Dorosoma cepedianum, Dorosoma pentenense, Shad, Harengula pensacolae, Sardines, Opisthonema oglinum, Macroinvertebrates, Anchoa hepsetus, Anchoa.

Physical and biological characteristics of the estuarine areas of the northern Gulf Coast of Louisiana were studied in a four-phase program. Phase I (Area Description) and IV (Biology)are summarized. For Phase I, tabular data are presented on water volume, vegetation, stream discharge, commercial fishery operations, coastal populations, pollution, filled areas, drained areas, and navigation channels in Louisiana's estuarine zone. Comparisons are made between past years' data and recent information. During Phase IV, biological biological sampling was conducted in six estuarine study areas of Louisiana. A total of 82 trawl, 12 seine, and 28 plankton stations were sampled weekly, bi-weekly, or monthly, from April 1968 through March 1969. A total of 100 species of fishes and 19 species of invertebrates were collected. Areal and seasonal distribution of these species are discussed. Also presented are data on historical commercial fisheries. Zooplankton results indicated a spring and fall maximum in all six study areas. Total counts ranged from a minimum of 116 per 100/cu m to a maximum of 377,393 per 100/cu m. (Mortland-Battelle)
W72-09097

SEQUENTIAL MORTALITY OF THE FISH FAUNA IMPOUNDED IN CONSTRUCTION OF A MARINA AT DANA POINT, CALIFORNIA,
California Univ., Los Angeles.
For primary bibliographic entry see Field 05C.
W72-09104

PATHWAYS OF ENERGY FLOW IN A SOUTH FLORIDA ESTUARY,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 05B.
W72-09112

ABUNDANCE OF YOUNG SCIAENID FISHES IN EVERGLADES NATIONAL PARK, FLORIDA, IN RELATION TO SEASON AND OTHER VARIABLES,
Miami Univ., Fla. Sea Grant Institution Program.
T. E. Jannke.
Available from the National Technical Information Service as COM-71-01063, $3.00 in paper copy, $0.95 in microfiche. Report No. NOAA-71092828; Sea Grant Technical Bulletin No. 11, January 1971. 138 p, 24 fig, 14 tab, 99 ref.

Descriptors: *Marine fishes, *Estuaries, *Larvae, Biological communities, Aquatic animals, Animal migrations, Florida, Drums, Ecological distribution, Population, Data acquisition, Statistical methods, Environment, Systematics, Diel migration.
Identifiers: *Everglades National Park, *Sciaenid fishes, Spotted sea trout, Cynoscion nebulosus, Bairdiella chrysura, Silver perch, Red drum, Sciaenops occellata.

Despite a recent increase in studies of the fishes of Everglades National Park the larval stages have been neglected. Furthermore, the ecology of larval fishes is poorly known; what ecological data are available on larval sciaenids has been collected primarily as supplementary data during taxonomic studies. Some information is provided for species of the family Sciaenidae, a commercially important group whose larvae generally depend upon estuaries as nursery grounds. The objectives were (1) to identify the larval sciaenids which enter Everglades National Park; (2) to record their seasonal abundance; (3) to investigate the relation between catch and physical variables such as salinity, temperature, moon phase, current velocity, and water volume; and (4) to investigate the diel variation in catch of spotted seatrout (Cynoscion nebulosus). The following species were collected: Bairdiella chrysura, Cynoscion nebulosus, Sciaenops ocellata, Cynoscion arenarius, Leiostomus xanthurus, Menticirrhus americanus, M. saxatilis, and Pogonias cromis. The first three were the most common in the samples. The seasonal abundance is shown for each of the eight species caught. (Mackan-Battelle)
W72-09113

SURVEY OF MACROPHYTE RESOURCES IN THE COASTAL WATER OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
C. P. McRoy, M. Mueller, S. Stoker, J. J. Goering, and M. T. Gottschalk.
Available from the National Technical Information Service as COM-71-01141, $3.00 in paper copy, $0.95 in microfiche. Report No. 3, R71-6, (NOAA-71101806), May 1971. 43 p, 14 fig, 3 tab, 40 ref.

Descriptors: *Marine plants, *Alaska, Sampling, *Systematics, Benthos, Scuba diving, Depth, Distribution patterns, Aerial photography, Remote sensing, Satellites (Artificial), Algae, Chlorophyta, Phaeophyta, Rhodophyta.
Identifiers: *Sea weeds, *Macrophytes, *Sea grasses, Television, Depth sounder, Vertical distribution, Cold Bay, Bermers Bay, Alaria, Nereocystis, Laminaria, Thalassiophyllum, Fucus, Schizymenia, Rhodomela, Rhodomenia, Marmion Island, Morria Reef, Bear Bay, Neva Island, Baird Island, Sholin Island, Winifred Island, Izembek Lagoon, Chaetomorpha cannabina, Chaetomorpha melagonium, Cladophora glaucescens, Cladophora stimpsonii.

A project was initiated to quantitatively assess natural stocks of seaweeds and seagrasses in Alaska coastal waters. The first year's progress is reported. A technique utilizing scuba divers and submarine television has been devised in which a diver makes parallel transects at right angles to shore on a sled towed by a surface vessel or winch. On the sled is also mounted the TV camera that makes a permanent record of the transect. A depth profile is also made with a recording depth sounder mounted on a Boston Whaler. In addition this can be used to identify certain types of kelp beds. This type of transect is rapid and gives a good record of the vertical distribution of the major species. Following the visual survey, divers take replicate samples of all plants within a quadrat. The survey to date indicates that seaweed species in the following genera attain high enough standing stocks in Alaska to sustain exploitation: Alaria, Nereocystis, Laminaria, Thalassiophyllum, Fucus, Schizymenia, Rhodomela, and Rhodomenia. Reprints of journal articles covering this research and a survey of eelgrass distribution on the Alaska Coast are included. (Mortland-Battelle)
W72-09120

DEPOSITION OF URANIUM IN THE SEDIMENT AND INTERSTITIAL WATER OF AN ANOXIC FJORD,
Hebrew Univ., Jerusalem (Israel). Dept. of Geology.
For primary bibliographic entry see Field 05B.
W72-09126

NEAR-BOTTOM ANIMAL POPULATION AND RELATED DEEP CIRCULATION IN THE OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.
J. D. Isaacs, and R. A. Schwartzlose.
Available from the National Technical Information Service as UCSD-34-P-127-12, $3.00 in paper copy, $0.95 in microfiche. August 1, 1971. 19 p, 7 fig. Project No. 127, Contract No. AT (04-3)-34.

Descriptors: *Oceans, *Cameras, *Deep water, *Fish populations, *Benthic fauna, *Ocean circulation, Indian Ocean, Pacific Ocean, Antarctic Ocean, Equipment, Photography, Currents (Water), Depth, Aquatic animals, Sharks, Shrimp, Eels, Water circulation, Plankton, Vertical migration, Invertebrates, Fish diets, Water pollution, Distribution patterns, Fish, Bethos.
Identifiers: Mediterranean Sea, Red Snapper, East Africa, Grenadiers, Comoro Island, Seychelles Island.

For three years, baited cameras photographed ocean animals at wide-ranging locations between 34 degrees N and 68 degrees S in portions of the North Pacific Ocean, Antarctic Ocean, western Indian Ocean, and the eastern Mediterranean Sea. The photographs show large numbers of fish at all depths to nearly 6000 m in the western North Pacific, very large sharks to depths of 2000 m, shrimp from the shallow depths to the deepest depths, and at least one fish in the anaerobic Santa Barbara Basin. Motion pictures were made off Southern California to depths of 3800 m and near the Comoro and Western Seychelles Islands off East Africa in depths to 1412 m. These motion pictures show the vigorous activities of fish over all of these depths, and clearly demonstrate the ease by which food is found in the dark, deep ocean by most fish. These studies also elucidate the nature of the behavior of deep fish and invertebrates including such unexpected features as the difficulty of the large sharks to locate a dead stationary bait at close range. Deep near-bottom current measurements also were made at the site of some of the camera observations. Currents have been found to be very slow (mean transport over 27 days of less than 1 cm/sec) in the Antarctic near the Ross Sea, to very fast (19 cm/sec) in the deepest passage between the South Pacific and the North Pacific near 9 degrees S - 110 degrees W and through Drake Passage with speeds up to 25 cm/sec. A short record taken at the north end of the Tonga Trench at a depth of 7.224 m indicates a possible 056 degree flow, nearly parallel to the axis of the trench at 0.6 cm/sec. (Jefferis-Battelle)
W72-09136

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

WATER RESOURCES OF DORCHESTER AND TALBOT COUNTIES, MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 04B.
W72-08500

FEASIBILITY OF OBTAINING A SOLID DRY BRINE EFFLUENT FROM INLAND DESALINATION PLANTS,
Dow Cheimical Co., Freeport, Tex.
P. E. Muehlberg, P. G. LeGros, B. P. Shepherd, and W. F. McIlhenny.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.25, Office of Saline Research and Development Progress Report no. 603, Sept. 1970, 95 p, 4 fig, 25 tab, 390 ref. OSW Contract 14-30-2576.

Descriptors: *Waste disposal, *Evaporators, *Desalination plants, *Scaling, Design, *Operating costs.
Identifiers: *Direct-contact evaporators, *Vertical-tube evaporators, *Multiple-effect distillation, *Driers, Fluidized-bed rivers, Feedwater treatment.

A combination of multiple-effect evaporation and direct-contact drying (exemplified by fluidized-bed drying) was chosen as the presently lowest cost and most practicable of ten processes potentially capable of converting to dry solids the effluent from a 2.4-mgd MSF plant. Effluent compositions were based on four actual brackish waters. Water pretreatment by lime-soda process premitted MSF effluent concentration factors between 5.5 and 91.7. Combined process mentioned was used for three of the effluents, and fluidized-bed drying alone for the fourth. Estimated total capital and unit conversion costs corresponding to a 2.5-mgd MSF plant varied from $0.42 million to $2.0 million, and $0.26 to $0.81 per 1000 gal of MSF plant product water, respectively. Estimated unit conversion costs vary from $0.12 to $0.45 corresponding to a 10-mgd MSF plant, and from $0.47 to $1.36 per 1000 gal corresponding to a 1-mgd MSF plant. (OSW)
W72-08556

IMPROVED REVERSE OSMOSIS MEMBRANES,
Gulf General Atomic Co, San Diego, Calif.
R. L. Riley, C. E. Milstead, H. K. Lonsdale, and K. J. Mysels.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price *1.50. Office of Saline Water Research and Development Progress Report No. 729, December 1971, 186 p, 63 fig, 74 tab, 57 ref. OSW Contract 14-30-2609.

Descriptors: *Reverse osmosis, *Permselective membranes, *Membranes, *Desalination, Ion transport, Separation techniques, Membrane processes, Pressure, Sea water.
Identifiers: *Ultrathin membranes, *Composite membranes, Cellulose nitrate-cellulose acetate support membranes, Fouling, Polyacrylic acid membranes, Polysulfone supports.

Continued improvement was sought in the transport properties of an integral thin-film composite membrane for seawater desalination applications. This membrane essentially consists of a thin film (400 to 800 A thick) of cellulose acetate deposited on a finely porous substrate of cellulose nitrate - cellulose acetate (CN-CA). This composite membrane is structurally similar to asymmetric Loeb-Sourirajan membranes, but provides flexibility in membrane properties by controlling the thickness and degree of substitution of the cellulose acetate thin film, as well as the porosity of the substrate. Upscaling of the preparative techniques are under way for the development of reverse osmosis modules for seawater desalination. Methods were sought for reducing the tendency of modified Loeb-Sourirajan type reverse osmosis membranes to foul. These studies involved the preparation of both uncharged and highly negatively charged cellulose acetate membranes and the measurement of fouling rates of spiral-wound modules of each membrane type in field tests with secondary sewage effluent. Polyelectrolyte membranes of polyacrylic acid (PAA) cast on polysulfone porous support for brackish water desalination applications were prepared and evaluated. These PAA membranes currently exhibit long term fluxes greater than 40 gal/ft 2-day at 800 psi with rejections of about 75% from.05 M NaCl and about 99% from 0.025 M Na2SO4 feeds. (OSW)
W72-08990

DESALINATION PROCESS BY MULTI-EFFECT, MULTI-STAGE FLASH DISTILLATION COMBINED WITH POWER GENERATION,
American Machine and Foundry Company, York, Pa. (Assignee).
W. R. Williamson.
U. S. Patent No. 3,489,652, 3 p, 3 fig, 13 ref; Patent Abstracts Section, Official Gazette, Vol. 870, No. 2, p 610, January 13, 1970.

Descriptors: *Patents, *Desalination, Desalination plants, Flash distillation, *Power plants, Evaporators, Evaporation, Separation techniques, Distillation, Condensation, Freshwater, Potable water, Sea water, *Nuclear power plants, Facilities, Heated water, Heat transfer.

Heat energy from a nuclear fueled heat generator is used first in a desalination or distilling plant. The multi-stage flash evaporator operates at temperatures of approximately 225 to 290 degrees F. Vapors are condensed to produce fresh water. Vapors produced in lower pressure stages are fed as steam through a turbine to drive a power generator. (Sinha-OEIS)
W72-09016

PERMEATION SEPARATION WITH ACID--GRAFTED NYLON MEMBRANES,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del. (Assignee).
H. H. Hoehn, and D. G. Pye.
U. S. Patent No. 3,524,546, 6 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol. 877, No. 3, p 580, August 18, 1970.

The components of fluid mixtures, particularly sea water are separated by the use of membranes formed from copolymers of nylon grafted with titratable acid groups, or preferably, their metal salts. (Sinha-OEIS)
W72-09025

REVERSE OSMOSIS WATER SOFTENING METHOD AND APPARATUS,
Union Tank Car Co. (Assignee).
B. H. Kryzer.
U. S. Patent No. 3,505,216, 3 p, 1 fig, 9 ref; Official Gazette of the United State Patent Office, Vol. 873, No. 1, p 218, April 7, 1970.

Descriptors: *Patents, *Reverse osmosis, *Water softening, Water treatment, *Demineralization, *Water purification, Membranes, Semipermeable membranes, Osmosis.

Raw water containing impurities is conducted into a water inlet zone at a pressure greater than the osmotic pressure. This causes a portion of the water to pass through a semi-permeable membrane into a soft water zone, removing the hardness-producing ions. The water that did not pass through the membrane is conducted into a hard water storage zone. (Sinha-OEIS)
W72-09028

3B. Water Yield Improvement

GEOLOGY AND GROUND-WATER SYSTEM IN THE GILA RIVER PHREATOPHYTE PROJECT AREA, GRAHAM COUNTY, ARIZONA,
Geological Survey, Washington, D.C.
W. G. Weist, Jr.
Geological Survey Professional Paper 655-D, 1971. 22 p, 10 fig, 3 plate, 2 tab, 10 ref.

Descriptors: *Groundwater, *Hydrogeology, *Water yield, *Groundwater recharge, *Arizona, Aquifers, Transmissivity, Water wells, Aquifer characteristics, Phreatophytes, Projects, Hydrologic data, Basic data collections, Groundwater movement, Vegetation, Water level fluctuations, Streamflow, Hydrographs, Soil-water-plant relationships.
Identifiers: *Gila River (Ariz), *Graham County (Ariz).

The Gila River Phreatophyte Project in Arizona is along a 15-mile reach of the river at the head of San Carlos Reservoir in the San Carlos Indian Reservation. The area is underlain by two major water-bearing units-the basin-fill deposits and the alluvial deposits. The basin-fill deposits have a coefficient of transmissivity of about 50 square feet per day and a storage coefficient of 0.00043. Wells drilled into the alluvial deposits yield as much as 600 gallons per minute of water. In the alluvial deposits, the average coefficient of transmissivity is 10,700 square feet per day and, the average storage coefficient is 0.12. The alluvial deposits are recharged by flow from the basin-fill deposits, by underflow from upstream, and by percolation from streamflow. Water levels in wells near the Gila River respond rapidly to increases in streamflow. (Woodard-USGS)
W72-08509

CLIMATE-ENGINEERING SCHEMES TO MEET A CLIMATIC EMERGENCY,
British Meteorological Office, Bracknell (England).
H. H. Lamb.
Earth-Science Reviews, Vol. 7, No. 2, p 87-95, April 1971. 4 fig, 10 ref.

Descriptors: *Arctic Ocean, *Climatic zones, *Saline waters, *Arid lands, *Water supply, Rivers, Interbasin diversion, Hydrologic cycle, Temperature, Polar regions, Geographical regions, Productivity, History.
Identifiers: *U.S.S.R., *Population pressures, *Crop monocultures, *Human ecology, *Climatic change.

The Soviet central Asian republics are among the crucially important food-producing regions of the Soviet Union. Extensive use of the Syr Darya and Amu Darya rivers for irrigation, resulting in great consumptive water loss, has dropped Caspian Sea levels and raised salinity levels, with great danger to its valuable fisheries. The Sea of Azov, described as the most productive fishing basin in the world, will probably suffer the same fate as the rivers Don and Kuban are consumed by industry and irrigation. These problems together with a widespread water table drop, leave no doubt that the water emergency which increasingly threatens Soviet Asia is real. This has led to the famous plan to divert the rivers Ob, Pechora and Yenesei from their outlets to the Arctic Ocean. Subsequently, this proposal was modified by the Soviet statement that only about 5-15% of the flow of these rivers will be diverted. What this project may do to world climates is conjectural. It is shown that inflow of Pacific Ocean water through the Bering Strait and fresh water from the rivers running into the North Polar basin are the most critical factors in the dilution of Arctic Ocean salinity levels. Should the Polar region salinity balance be upset, the consequences for world climates could be extensive as shown by some admittedly incomplete studies. A plea is made for extreme caution in manipulating such vast climatic systems, but will probably go unheeded because of world food needs. (Casey-Arizona)
W72-08900

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: ALAMOGORDO CREEK, N. MEX.,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02B.
W72-08911

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: NEWELL, S. DAK.,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 02B.
W72-08916

LEGAL AND POLICY ASPECTS OF GEOTHERMAL RESOURCE DEVELOPMENT,
Duncan, Allen and Mitchell, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-08976

CONTROLLED ATMOSPHERIC CONVECTION IN AN ENGINEERED STRUCTURE,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 02B.

W72-09003

PROCESS FOR COLLECTING AND STORING FRESH WATER IN EARTH,
A. Kopp, Jr.
U. S. Patent No. 3,640,074, 4 p, 9 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 895, No. 2, p 435, February 8, 1972.

Descriptors: *Patents, Fresh water, Reservoirs, Evaporation, Salt water, Water supply, Water management (Applied).

The process of restoring fresh water in water permeable earth adjacent to a body of salt water consists of establishing and maintaining a thin water impermeable barrier in the earth downward from the level of high point of salt water intrusion to a non-water-permeable earth layer. Saline water is extracted from the bottom part of the permeable earth on the landward side of the barrier and discharged to the salt water side of the barrier. The barrier is formed and maintained by freezing in situ. It receives its supply of refrigerant from a condenser that is cooled by saltwater. (Sinha-OEIS)
W72-09021

FRESH-WATER CISTERN,
C. Renshaw, and J. T. Trippe.
U. S. Patent No. 3,517,513, 2 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 875, No. 4, p 747, June 30, 1970.

Descriptors: *Patents, Freshwater, *Water storage, *Cisterns, Reservoir design, *Rain water, Water sources, *Water conservation.

A floating cistern is provided in the form of an open water reservoir made of impermeable sheet material partly submerged in a body of nonpotable water. The reservoir is anchored or moored so it can rise and fall with tides or with the changing volume of collected rain water. Evaporation from the cistern is limited by depositing a floating layer of inert matter on the collected liquid. (Sinha-OEIS)
W72-09027

WINTER OROGRAPHIC CLOUD MODIFICATION EXPERIMENT IN THE ROCKY MOUNTAINS OF COLORADO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
National Science Foundation, Washington, D.C.

Available from the National Technical Information Service as PB-205 227F, $3.00 in paper copy, $0.95 in microfiche. December 20, 1971. 20 p, 1 dwg.

Descriptors: *Cloud seeding, *Artificial precipitation, *Climatology, *Snow management, *Weather modification, Colorado, Snow, Snowpacks, Snowfall, Silver iodide, Halides, Condensation, Chemistry of precipitation, Orography, Rock Mountain Region, Storms, Water sources, Chemical precipitation, Chemicals, Aquatic microorganisms, Snow removal, Toxicity, On-site laboratories, Project purposes.
Identifiers: *Environmental Impact Statements.

Investigation of orographic cloud and precipitation processes over the Rocky Mountains near Climax, Colorado is intended to increase understanding of the natural processes involved in increasing the snowpack from winter storms through random seeding of clouds with silver iodide from ground generators. The seeding is conducted from November through April on selected mountain storm systems in which cloud temperatures at the 500-mb. level range between-10 degrees C. and -25 degrees C. Approximately 15 systems are seeded each year with a net increase in snowfall of approximately 20 percent. Most studies indicate no harmful ecological impact from the increased snowpack; no danger of avalanches, landslides, or flooding; no danger to conifers from the silver iodide; no harm to operating personnel or local population from the generators and no significant toxic effect from the silver on higher plant and animal life. Adverse effects relate to an increase in snowpack removal in the target and downwind areas as well as possible inhibition of growth of aquatic microorganisms by the increased silver content of freshwater bodies. The only alternative considered is project termination. Comments received from governmental and private institutions are summarized. (Blank-Florida)
W72-09040

DEVELOPMENT OF ECONOMIC WATER HARVEST SYSTEMS FOR INCREASING WATER SUPPLY,
Arizona Water Resources Research Center, Tucson.
C. B. Cluff, G. R. Dutt, P. R. Ogden, and J. L. Stroehlein.
Available from the National Technical Information Service as PB-209 865. Project Completion Report, September 1971. 53 p, 9 fig, 14 tab, 24 ref. OWRR B-005-ARIZ (6).

Descriptors: *Water harvesting, *Water yield improvement, *Water conservation, Rainfall-runoff relationships, Seepage control, Evaporation control.
Identifiers: *Gravel covered plastic, *Sodium treated catchments, Covered storage tanks.

The use of gravel covered plastic for the collection of precipitation was studied. Design specifications were developed so as to maximize efficiency with regard to gravel sizes versus degree and length of slope of the catchment. Different installation techniques are proposed including the use of a Gravel Extracting Soil Sifter (GESS) which was developed and successfully tested. This equipment will extract gravel from the soil, lay plastic and cover the plastic with gravel in one operation thus reducing installation and replacement costs. Water yield was investigated on different soil types in a coordinated laboratory and field investigation. Results indicate that sodium treatment is not effective unless the surface of the soil is relatively free of a vegetative or gravel cover so that energy of the raindrop can aid the sodium in dispersing the clay minerals to form an effective seal. A good initial response was obtained from a light sodium chloride treatment on both desert shrub and cleared watersheds with soils containing less than 10 percent clay, however, the yields diminished with time due primarily to sodium induced clay movement through the soil profile.
W72-09060

3C. Use of Water of Impaired Quality

EFFECT OF LITHIUM ON GROWTH, SALT ABSORPTION, AND CHEMICAL COMPOSITION OF SUGAR BEET PLANTS,
Ministry of Agriculture, Cairo (Egypt). Div. of Plant Nutrition.
For primary bibliographic entry see Field 03F.
W72-08570

IRRIGATION REGIMES IN A SEMI-ARID AREA AND THEIR EFFECTS ON GRAPEFRUIT YIELD, WATER USE AND SOIL SALINITY,
Volcani Inst. of Agricultural Research, Rehovoth (Israel).
For primary bibliographic entry see Field 03F.
W72-08871

ABRIDGED BIBLIOGRAPHY. ECONOMICS OF WATER QUALITY--SALINITY POLLUTION,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W72-08883

PREDICTION OF EXCHANGEABLE SODIUM PERCENTAGE FROM CATION EXCHANGE EQUILIBRIA,
Udaipur Univ. (India).
For primary bibliographic entry see Field 02G.
W72-08886

IRRIGATION REGIMES IN A SEMI-ARID AREA AND THEIR EFFECTS ON GRAPEFRUIT YIELD, WATER USE AND SOIL SALINITY,
Volcani Inst. of Agricultural Research, Rehovot (Israel) and Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 03F.
W72-08888

THE RAJASTHAN CANAL PROJECT,
For primary bibliographic entry see Field 03F.
W72-08891

STUDY OF REUTILIZATION OF WASTEWATER RECYCLED THROUGH GROUNDWATER,
Eastern Municipal Water District, Hemet, Calif.
D. F. Boen, J. H. Bunts, Jr., and R. J. Currie.
Copy available from GPO Sup Doc, $1.50; microfiche from NTIS as PB-209 859, $0.95. Environmental Protection Agency Water Pollution Control Research Series, July 1971, 180 p, 71 fig, 27 tab, 12 ref. EPA Program 16060 DDZ 07/71.

Descriptors: *Groundwater recharge, *Reclaimed water, Groundwater basins, California, Groundwater movement, *Water reuse.

A project to demonstrate the feasibility and safety of recycling water under operating conditions was performed in the Hemet-San Jacinto Valley of the State of California. Since the Valley is a closed basin, and is dependent in part upon imported water, it was felt that recycling of the water would ultimately lead to a reduction in the salt input and the resultant degradation of the existing underground reservoir. Extensive geological investigations indicated that the basin was not homogeneous in nature but had clay lenses and faulting which interfered with the creation of a classic mound. Partially as a consequence, the recharge of 5,380 acre feet of wastewater during this six and one-half year period had no effect on surrounding water wells. The project added considerable knowledge and experience to the technology of intermittent wastewater percolation and associated monitoring techniques. A novel feature of the project was the employment of highly sensitive temperature probes to trace the lateral migration of the recharged water, much of which appears to be escaping as shallow underflow to the San Jacinto River and hence not reaching the deep groundwater table. (EPA abstract)
W72-08982

3D. Conservation in Domestic and Municipal Use

CONSERVATION AND WATER-RESOURCE DEVELOPMENT,
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-08536

THE STORY OF THE WATER SUPPLY FOR THE COMSTOCK,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 06E.
W72-08760

IDENTIFICATION OF URBAN WATERSHED UNITS USING REMOTE MULTISPECTRAL SENSING,
Colorado State Univ., Fort Collins. Dept. of Watershed Science.
For primary bibliographic entry see Field 07B.

W72-08791

USE AND RE-USE OF INLAND WATERS,
National Capital Development Commission, Canberra (Australia).
For primary bibliographic entry see Field 05G.
W72-08887

THE RELATIONSHIP BETWEEN HOUSING AND WATER RESOURCES PLANNING AND MANAGEMENT,
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W72-08952

PHILOSOPHY OF WATER SYSTEMS,
Detroit Metro Water Dept., Mich.
For primary bibliographic entry see Field 06B.
W72-08959

THE BALTIMORE REGION'S WATER-SUPPLY PLAN,
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 06B.
W72-08961

SOCIOECONOMIC PATTERNS OF OUTDOOR RECREATION USE NEAR URBAN AREAS,
Vermont Univ., Burlington. Agricultural Experiment Station; and Inter-American Inst. of Agricultural Sciences, Turrialba (Costa Rica).
For primary bibliographic entry see Field 06B.
W72-08968

THE RECREATIONAL BUSINESS DISTRICT,
Glassboro State Coll., N.J.; and Kent State Univ., Ohio.
For primary bibliographic entry see Field 06B.
W72-08970

A SYSTEMS STUDY OF FUTURE GROUNDWATER DEVELOPMENT COSTS IN THE CHICAGO REGION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 06B.
W72-08972

A LINEAR ANALYSIS OF AN URBAN WATER SUPPLY SYSTEM,
Nebraska Soil and Water Conservation Commission, Lincoln.
For primary bibliographic entry see Field 06A.
W72-08977

REAL-ESTATE LAKES,
Geological Survey, Washington, D.C.
D. A. Rickert, and A. M. Spieker.
Geological Survey Circular 601-G, 1971. 19 p, 7 fig, 7 ref.

Descriptors: *Artificial lakes, *Suburban areas, *Urbanization, *Urban hydrology, *Water management (Applied), Ponds, Recreation, Aesthetics, Reservoirs, Lakes, Eutrophication, City planning.
Identifiers: *Real estate lakes.

A real-estate lake can be either an asset or a liability. With proper planning and management, it can enhance the esthetic quality of the landscape, provide water-oriented recreation, and increase the property value of the surrounding land. With poor planning and management, a lake can become a weed-choked, four-smelling mudhole. Proper planning is the key to success in the development of real-estate lakes. The basis for this proper planning is a thorough knowledge of the hydrology of lakes combined with an anticipation of the problems that may arise in their development and use. On this basis, preliminary planning can pinpoint the potential problems of lake development and can provide an assessment of their potential severity. This assessment of problems permits a realistic estimate of the total cost of developing a real-estate lake, rather than simply the cost of construction. In the long run, time and money can be saved by preventing or minimizing problems at the outset and by eliminating those areas where combined construction and maintenance costs would be economically prohibitive. Even well planned lakes require constant management to be maintained at a desirable level of physical, chemical, and esthetic quality. (Knapp-USGS)
W72-08997

THE NAVIGATION PROJECT, BRISTOL MARINA, DELAWARE RIVER, BUCKS COUNTY, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 04A.
W72-09034

ENVIRONMENTAL PROTECTION--THE CONSERVATION COMMISSION APPROACH,
Massachusetts Univ., Amherst. Dept. of Government.
For primary bibliographic entry see Field 06E.
W72-09048

USE OF A PRICING MODEL FOR EFFICIENT WATER SUPPLY ALLOCATION,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 06A.
W72-09068

A DECISION-SEQUENCE MODEL OF RESIDENTIAL OCCUPANCY OF URBAN FLOOD PLAINS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 06A.
W72-09073

3E. Conservation in Industry

DEEP SEABED HARD MINERAL RESOURCES ACT.
For primary bibliographic entry see Field 06E.
W72-08833

THE EFFECT OF WATER POLLUTION CONTROL LAWS ON THE LOCATION OF PULP AND PAPER MILLS,
Braniff Graduate School of Management, Irving, Tex.
For primary bibliographic entry see Field 05G.
W72-08841

YELLOW CREEK PORT PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Chattanooga.
For primary bibliographic entry see Field 04A.
W72-08845

INDUSTRIAL RE-USE OF WATER: AN OPPORTUNITY FOR THE WEST,
National Association of Manufacturers, New York. Conservation Committee.
For primary bibliographic entry see Field 05D.
W72-08858

3F. Conservation in Agriculture

MONITORING EARTH RESOURCES FROM AIRCRAFT AND SPACECRAFT,
California Univ., Berkeley. Forestry Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W72-08490

ANALYSIS OF AGRICULTURAL RESOURCES IN THE IMPERIAL VALLEY, CALIFORNIA,
California Univ., Berkeley. Forestry Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W72-08493

THE USE OF SMALL-SCALE AERIAL PHOTOGRAPHY IN A REGIONAL AGRICULTURAL SURVEY,
California Univ., Berkeley. Forestry Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W72-08498

WATER FOR CULTURE IN THE CRANMOOR AREA OF CENTRAL WISCONSIN,
Geological Survey, Washington, D.C.
L. J. Hamilton.
Available from GPO, Washington, DC, 20402; Price $1.00 paper cover; Stock No 2401-1178; Geological Survey Water-Supply Paper 1999-I, 1971. 20 p, 2 fig, 2 plate, 4 tab, 4 ref.

Descriptors: *Cranberries, *Crops, *Agriculture, *Hydrologic budget, *Wisconsin, Wetlands, Irrigation, Flooding, Crop response, Surface waters, Groundwater, Water quality, Climate, Geology, Reservoirs, Hydrographs, Hydrologic data, Soil-water-plant relationships.
Identifiers: *Cranmoor area (Wis).

The Cranmoor area of central Wisconsin is the principal cranberry producing area of the State. Cranberries are grown in only about 2.5 square miles of an 80-square-mile marsh and swamp in the Cranberry Creek basin. Reservoirs and ditches were constructed throughout 25 square miles of marsh for better management of the area's natural water supply. Additional water is diverted into the basin to supplement the cranberry needs. In the 1966-67 hydrologic budget for Cranberry Creek basin, annual inputs were 27.8 inches of precipitation, 3.8 inches of surface-water diversions into the basin, and 1.1 inches decrease in stored water. Annual outputs were 20.8 inches of evapotranspiration, 11.7 inches of runoff, and 0.2 inch of groundwater outflow. During the 1966-67 period, precipitation averaged about 3 inches per year below normal. The water used for cranberry culture is almost exclusively surface water. Although the quantity of surface water is adequate, the pH (generally 5.7-6.7) is slightly high for optimum use. Groundwater, although not presently used for cranberries, is available with yields as much as 1,000 gpm in the central, southern, and eastern parts of the basin. (Woodard-USGS)
W72-08506

EFFECTS OF WATER TABLE HEIGHT ON SOIL AERATION AND CROP RESPONSE,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
E. A. Hiler, R. N. Clark, and L. J. Glass.
American Society of Agricultural Engineers Transactions, Vol 14, No 5, p 879-882, September-October 1971. 8 fig, 1 tab, 11 ref.

Descriptors: *Soil-water-plant relationships, *Water table, *Lysimeters, Aeration, Drainage, Drainage effects, Crop response.
Identifiers: *Soil oxygen.

The first step for agricultural drainage design is determination of the drainage requirements of crops. Grain sorghum was grown in field lysimeters in which the water table was regulated automatically. Undisturbed soil cores which were one meter in diameter and two meters deep made up the lysimeters. Rainfall was kept off the lysimeters with a shelter system. Drastic reductions both in quantity and quality of grain sorghum yield occurred when water tables were maintained at 30

and 60 cm as compared to the 90- and 120-cm treatments. Reduced growth of grain sorghum occurred in general with the shallower water tables. Considerable crop oxygen stress occurred in the 30-cm treatment in which oxygen diffusion rates never exceeded 0.2 millionths of a g per sq cm per min in the root zone during the growing season; detrimental oxygen stress also occurred in the 60-cm treatment where oxygen diffusion rates in the crop root zone ranged from 0.4 to 0.9 millionths of a g per sq cm per min during the growing season. Leaf temperature and leaf diffusion resistance were not appreciably affected by oxygen deficiencies in the crop root zone. (Knapp-USGS)
W72-08521

THE DEATH OF SPIKELETS IN WHEAT DUE TO WATER DEFICIT,
Macquarie Univ., North Ryde (Australia). School of Biological Sciences.
J. M. Morgan.
Aust J Exp Agr Anim Husb. 11 (50): 349-351. 1971.
Identifiers: Death, Deficit, Spikelets, Triticum-aestivum-M, Wheat-M.

Two wheat (Triticum aestivum) cultivars, 'Heron' and 'Summit', were grown under controlled conditions and droughted at stamen initial formation, at the completion of spikelet differentiation, and at ear emergence. Dead spikelets were induced by droughting at ear emergence. Fewer spikelets died on 'Heron' than 'Summit' plants under all except the most severe drought conditions.--Copyright 1972, Biological Abstracts, Inc.
W72-08529

EFFECT OF LITHIUM ON GROWTH, SALT ABSORPTION, AND CHEMICAL COMPOSITION OF SUGAR BEET PLANTS,
Ministry of Agriculture, Cairo (Egypt). Div. of Plant Nutrition.
Adel M. El-Sheikh, A. Ulrich, and T. C. Broyer.
Agron J. 63 (5): 755-758. 1971.
Identifiers: Absorption, Beet-D, Beta-Vulgaris-D, Calcium, Composition, Growth, Lithium, Permeability, Plants, Potassium, Salt, Selective, Sugar, Toxicity.

Sugar beets (Beta vulgaris) are grown in some areas where saline soils or irrigation water may contain Li. A study of the effects of Li on the growth, salt absorption and chemical composition of sugar beet plants was undertaken for plants grown under smog-free clear-glass greenhouse conditions in nutrient solutions that were either low or high in K concentration, i.e., 1.0 or 12.0 meq/liter. Lithium supply was varied from 0.25 to 8.0 meq/liter (1.75 to 56.0 ppm). Lithium was detrimental to sugar beet growth at a very low concentration (0.5 meq/liter), especially to fibrous roots under low K conditions. Fibrous roots with Li concentration of only 0.01% weighed 40% less than those of the control. Li concentrations in the plant tissues were very low, due in part to the low rate of Li absorption. Li, after absorption, was readily transported to the shoots, and little of it was retained in the fibrous roots even at a Li supply of 1.0 meq/liter. In the shoots Li increased in concentration with leaf age, with the blades being higher in Li concentration than the corresponding petioles. Li induced an increase of K concentration and a decrease of Ca concentration in the plants, especially in the mature and old leaves. In these instances Li may have an effect on selective membrane permeability or directly on Ca absorption. Li, as with Na, was not readily absorbed until K had been depleted from the nutrient solution, but unlike Na, Li not only failed to enhance growth, but depressed it. Also, the petiole K values remained high for all low K treatments and only the old mature blades and old blades of K deficient plants reached the minimum K value of about 0.5%.--Copyright 1972, Biological Abstracts, Inc.
W72-08570

SOME RESULTS OF INVESTIGATIONS ON EROSION CONTROL IN WINTER WHEAT STANDS (IN RUSSIAN),
A. T. Kolpakov.
Sb Nauchn Tr Donsk S-Kh Inst. 4 (3): 10-18. 1968.
Identifiers: Control, Erosion, Furrowing, Moisture, Ridging, Soil, Stands, USSR, Wheat-M, Winter, Yield.

Meltwater runoff in winter wheat stands is directly related to autumn moistening and depth of freezing. In the Rostov Region the sowing of winter wheat on ridged and furrowed fields with check dams considerably reduces meltwater runoff and soil erosion, increases the moisture reserve in soil and improves crop yields.--Copyright 1972, Biological Abstracts, Inc.
W72-08576

WATER REGIME OF SOIL IN RELATION TO THE USE OF HERBICIDES, (IN RUSSIAN),
For primary bibliographic entry see Field 02G.
W72-08622

CORNUDAS, NORTH AND CULP DRAWS WATERSHED, TEXAS, AND NEW MEXICO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-08636

CALCULATION FROM SOIL PROPERTIES OF WILTING HUMIDITY, (IN CZECH),
Research Inst. of Irrigation Farming, Bratislava (Czechoslovakia).
Oto Brezny.
Polnohospodarstvo. 15 (11): 944-950. Illus. 1969. English summary.
Identifiers: Calculation, Humidity, Irrigation, Planning, Soil, Wilting.

The methods of determining the wilting point (WP) can be used in designing or setting up an appropriate irrigation regimen when results of direct determination cannot be used. Given the content clay, the formula, WP % volume = 2.97 + 0.33 x - 0.0012, is used. Given the content of clay and that of humus, the following function may be used: WP % volume = 0.24 x 0.53 y + 3.5, where x the per cent content of clay, and y = the per cent content of humus. The regression equation of the 2nd grade for the calculation of WP from the content of clay and that of humus has the following form: WP = 0.27x + 1.55y - 0.002x2 - 0.014xy- 0.05y2 = 1.96. This equation does not substantially increase the exactness of the result, but it increases rather substantially the extent of the calculation operations. All these equations can be applied only to soils with a clay content up to 70% and with a humus content up to 3%.--Copyright 1972, Biological Abstracts, Inc.
W72-08649

ACTUAL EVAPOTRANSPIRATION AS DETERMINED FROM SOIL-WATER AND CANOPY CHARACTERISTICS AND POTENTIAL EVAPOTRANSPIRATION.
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02D.
W72-08720

PESTICIDES IDENTIFICATION AT THE RESIDUE LEVEL.
For primary bibliographic entry see Field 05A.
W72-08738

QUANTITATIVE EVALUATION OF TRANSPIRATION OF COTTON PLANTS (IN RUSSIAN),
For primary bibliographic entry see Field 02D.
W72-08748

EFFECTS OF SOIL MOISTURE STRESS ON TWO VARIETIES OF UPLAND COTTON IN ISRAEL: III. THE BET-SHE'AN VALLEY,
Hebrew Univ., Jerusalem (Israel). Faculty of Agriculture.
A. Marani, and A. Amirav.
Exp Agric. Vol 7, No 4, p 289-301. 1971. Illus.
Identifiers: Bet-Shean Valley, *Cotton, Irrigation, Israel, Lint, *Soil moisture, Stress, *Crop response, *Soil-water-plant relationships.

The effects of moisture stress during various stages of the development of 2 cultivars of upland cotton (Gossypium hirsutum) ('Acala 4-42' and 'Detapine Smoothleaf') were studied in 2 irrigation experiments in the Bet-She'an valley, where summer temperatures were high and evapotranspiration in the fully irrigated treatments was up to 8-10 mm/day in July and Aug. Optimum time for first irrigation in the Bet-She'an an valley was 2 or 3 weeks before flowering, and 6 or 7 irrigations, if timed to prevent moisture stress, were sufficient to give high yields and good lint quality. Lint yield ranged from 270 kg/ha. in non-irrigated to 2000 kg/ha. in the fully irrigated treatments in 1966.--Copyright 1972, Biological Abstracts, Inc.
W72-08772

A STUDY OF THE EFFECT OF SOIL COMPACTION AND MOISTURE REGIMES ON THE GROWTH AND CHEMICAL COMPOSITION OF MAIZE PLANTS,
Punjab Agricultural Univ., Hissar (India). Dept. of Soils.
J. P. Gupta, and I. P. Abrol.
J Indian Soc Soil Sci. Vol 18, No 4, p 397-403. 1970. Illus.
Identifiers: Calcium, *Soil compaction, Composition, Density, Growth, Magnesium, *Maize-M, Nitrogen, Phosphorus, Plants, Potassium, Regimes, Sodium, *Soil moisture.

The effects of 4 levels of soil bulk density and 3 moisture regimes on the growth and chemical composition of maize plants are described. Increasing bulk density from 1.38 to 1.70 resulted in progressive decrease in the various growth attributes studied, the decrease being maximum when the bulk density was increased beyond 1.57 particularly when in association with dry moisture regimes. Increased bulk density resulted in appreciable increase in concentration of N and P and to somewhat lesser extent the concentration of K, Na, Ca and Mg. The total uptake by plants followed the same trend as the various growth attributes.--Copyright 1972, Biological Abstracts, Inc.
W72-08775

WEED CONTROL IN SUGAR BEET WITH SINGLE AND SPLIT APPLICATIONS OF HERBICIDES,
Harper Adams Agricultural Coll., Newport (England).
M. Eddowes.
J Agric Sci. Vol 77, No 2, p 247-252. 1971.
Identifiers: *Sugar beet-D, Control, England, *Herbicides, Lenacil, Midlands, Phenmedipham, Pyrazon, *Weed control.

Two main approaches to the problem of providing reliable season-long control of annual weeds in sugar beet are the use of mixtures of herbicides applied pre-planting and incorporated into the soil during seed bed preparation, and the use of split applications with a residual herbicide applied pre-emergence followed by a contact herbicide applied post-emergence. The second approach was examined in a series of field experiments from 1967 to 1969, on light to medium sandy loam soils in the West Midlands. Comparisons were made between pre-emergence application of lenacil and pyrazon, pre-emergence application of lenacil and pyrazon followed by post-emergence application of phenmedipham for weed control in sugar beet. Under dry soil conditions in April 1967, lenacil and pyrazon controlled only about 40% of the annual weeds, but in 1968 and 1969, when moist soil con-

ditions predominated in April and May, lenacil and pyrazon controlled 80-95% of the annual weeds. Phenmedipham applied post-emergence gave about 90% control of annual broadleaved weeds initially, but it seemed unlikely that a single application of this herbicide would provide satisfactory weed control in sugar beet. In each of the 3 years 2967-9, a split application of a soil-acting residual herbicide (pre-emergence) followed by phenmedipham (post-emergence) gave outstanding weed control and enabled sugar beet to be established and grown until mid-June at least, in a near weed-free environment. This technique was the most effective for weed control in sugar beet on light to medium sandy loam soils in the West Midlands.--Copyright 1972, Biological Abstracts, Inc.
W72-08778

APPLICATION OF THE PRINCIPLE OF CALCULATED RISK TO SCHEDULING OF SUPPLEMENTAL IRRIGATION. II. USE ON FLUE--CURED TOBACCO,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
W. H. Allen, and J. R. Lambert.
Agric Meteorol. Vol 8, No 4/5, p 325-340. 1971. Illus.
Identifiers: Daylength, Flue, *Irrigation, *Model studies, Moisture, Precipitation, *Risk, Scheduling, Simulation, Soil, Temperature, *Tobacco-D, Transpiration.

A simulation model was constructed to test the application of an irrigation-scheduling decision model which incorporated the basic concepts of calculated risk. Inputs for the model included: the official probability precipitation forecasts for the periods today, tonight, and tomorrow; initial soil moisture content; daily precipitation; daily mean temperatures; daily potential evapotranspiration and daylength values; functions relating existing soil moisture content and stage of growth to the corresponding damage done to the crop; and cost of irrigation. The loss functions were developed specifically for flue-cured tobacco. Two methods were used for calculating the cost of the irrigation. The decision criterion was applied by means of the simulation model to data from 3 growing seasons. The results were compared to the results as arrived at by irrigating at a 50% available moisture depletion level. It was found that the new criterion (using either method for calculating the cost of irrigation) yielded less total cost plus loss and achieved a better utilization of the available water than did the 50% criterion. While the state of the art does not allow extremely well-based development of the imput variables and parameters, available data have shown the concepts of the model to yield adequate results. Much future development of the approach remains, however.--Copyright 1972, Biological Abstracts, Inc.
W72-08779

IRRIGATION REGIMES IN A SEMI-ARID AREA AND THEIR EFFECTS ON GRAPEFRUIT YIELD, WATER USE AND SOIL SALINITY,
Volcani Inst. of Agricultural Research, Rehovoth (Israel).
H. Bielorai, and J. Levy.
Isr J Agr Res. 21 (1): 3-12. 1970. Illus.
Identifiers: Arid, Chlorides, Grapefruit-D, Irrigation, Leaching, Rain, Regimes, Salinity, Soil, Yield.

Yield was reduced by 28% in the 6th irrigation season in plots irrigated every 40 days, compared with those irrigated every 18 days. Yield response to the irrigation regimes was correlated with the number of drought days in which the soil moisture stress in the main root zone (0-90-cm layer) was above 1 atm. A considerable accumulation of chloride in the soil profile due to the irrigation water was observed. In some years the winter rains leached out the chlorides introduced with the irrigation water from the upper soil layers, but seldom below the entire root zone. The mean chloride concentration in the soil profile reached about 15 meq/l in most irrigation treatments after 3 irrigation seasons.--Copyright 1971, Biological Abstracts, Inc.
W72-08871

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, HARDING COUNTY,
New Mexico Agricultural Experiment Station, University Park.
H. J. Maker, D. S. Pease, and J. U. Anderson.
Available from the National Technical Information Service as PB-209 754, $3.00 in paper copy, $0.95 in microfiche. New Mexico State University Agricultural Experiment Station Research Report 165, 1970, 33 p, 7 fig, 8 tab, 7 ref. OWRR B-015-NMEX (2).

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Harding County (N Mex), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

Information is presented on the suitability of soils in Harding County, New Mexico for irrigation. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. The irrigation land classes were estimated on the basis of the soil data available. The data were organized and presented on the basis of soil associations shown on a general soil map and on an irrigation land classification map. Harding County has about 1,368,300 acres, of which about 67 percent was considered suitable for irrigation. About 160,385 acres were in irrigation land class 1; 353,373 acres in class 2; 358,733 acres in class 3; and 146,032 acres in class 4. The remaining 449,777 acres in the county were in land class 6, which was not considered suitable for irrigation. Information is provided on soil resources that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color, are included. (Creel-New Mexico)
W72-08876

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, EDDY COUNTY,
New Mexico Agricultural Experiment Station, University Park.
H. J. Maker, V. G. Link, and J. U. Anderson.
Available from the National Technical Information Service as PB-209 755, $3.00 in paper copy, $0.95 in microfiche. New Mexico State University Agricultural Experiment Station Research Report 170, 1970, 34 p, 5 fig, 8 tab, 8 ref. OWRR B-015-NMEX (3).

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Eddy County (N Mex), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

Information is presented on the suitability of soils in Eddy County, New Mexico for irrigation. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. The general soil map and a detailed soil survey provided the information needed for the irrigability classification map. The data were organized and presented on the basis of soil associations shown on the general soil map and on the irrigation land classification map. Eddy County has about 2,675,000 acres, of which about 34 percent was considered suitable for irrigation. About 357,249 acres were in irrigation land class 1; 108,533 acres in class 3; and 113,522 acres in class 4. The remaining 1,991,061 acres in the county were in land class 6, which was not considered suitable for irrigation. Information is provided on soil resources that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color, are included. (Creel-New Mexico)
W72-08877

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, LUNA COUNTY,
New Mexico Agricultural Experiment Station, University Park.
H. J. Maker, O. F. Bailey, and J. U. Anderson.
Available from the National Technical Information Service as PB-209 756, $3.00 in paper copy, $0.95 in microfiche. New Mexico State University Agricultural Experiment Station Research Report 176, 1970, 31 p, 3 fig, 8 tab, 7 ref. OWRR B-015-NMEX (4).

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Luna County (N Mex), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

Information is presented on the suitability of soils in Luna County, New Mexico for irrigation. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. A general soil map and a detailed soil survey provided the information needed for the classification for irrigation. The data were organized and presented on the basis of soil associations shown on the general soil map and on an irrigation land classification map. Luna County has about 1,892,500 acres, of which about 64 percent was considered suitable for irrigation. About 294,000 acres were in irrigation land class 1; 299,000 acres in class 2; 320,000 acres in class 3; and 338,000 acres in class 4. The remaining 678,000 acres in the county were in land class 6, which was not considered suitable for irrigation. Information is provided on soil resources that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color, are included. (Creel-New Mexico)
W72-08878

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, HIDALGO COUNTY,
New Mexico Agricultural Experiment Station, University Park.
H. J. Maker, D. N. Cox, and J. U. Anderson.
Available from the National Technical Information Service as PB-209 757, $3.00 in paper copy, $0.95 in microfiche. New Mexico State University, Agricultural Experiment Station Research Report 177, 1970, 28 p, 3 fig, 8 tab, 7 ref. OWRR B-015-NMEX (5).

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Hidalgo County (NMex), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

Information is presented on the suitability of soils in Hidalgo County, New Mexico for irrigation. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. General soil map and a detailed soil survey provided the information needed for the classification for irrigation. The data were organized and presented on the basis of soil associations shown on the general soil map and on an irrigation land classification map. Hidalgo County has about 2,206,100 acres, of which about 46 percent was considered suitable for irrigation. About 228,000 acres were in irrigation land class 1; 208,000 acres in class 2; 346,000 acres in class 3; and 244,000 acres in class 4. The remaining 1,180,000 acres in the county were in land class 6, which was not considered suitable for irrigation. Information is

provided on soil resources that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color are included. (Creel-New Mexico)
W72-08879

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, LEA COUNTY,
New Mexico Agricultural Experiment Station, University Park.
H. J. Maker, M. T. Turner, and J. U. Anderson.
Available from the National Technical Information Service as PB-209 758, $3.00 in paper copy, $0.95 in microfiche. New Mexico State University, Agricultural Experiment Station Research Report 178, 1970, 40 p, 4 fig, 8 tab, 7 ref. OWRR B-015-NMEX (6).

Descriptors: *New Mexico, Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Lea County, *Soil association, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

Information is presented on the suitability of soils in Lea County, New Mexico for irrigation. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. A general soil map and a detailed soil survey provided the information necessary for the classification for irrigation. The data were organized and presented on the basis of soil associations shown on the general soil map and on an irrigation land classification map. Lea County has about 2,812,200 acres, of which about 44 percent were considered suitable for irrigation. About 30,000 acres were in irrigation class 1; 420,000 acres in class 2; 617,000 acres in class 3; and 163,000 acres in class 4. The remaining 1,582,000 acres in the county were in land class 6, which was not considered suitable for irrigation. Information is provided on soil resources that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color, are included. (Creel-New Mexico)
W72-08880

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, DONA AND COUNTY,
New Mexico Agricultural Experiment Station, University Park.
H. J. Maker, R. E. Neher, P. H. Derr, and J. U. Anderson.
Available from the National Technical Information Service as PB-209 759, $3.00 in paper copy, $0.95 in microfiche. New Mexico State University, Agricultural Experiment Station Research Report 183, 1971, 41 p, 5 fig, 7 tab, 8 ref. OWRR B-015-NMEX (7).

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Dona Ana County (NMex), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil Description.

Information is presented on the suitability of soils in Dona Ana County, New Mexico for irrigation. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. A general soil map and a detailed soil survey provided the information necessary for the classification for irrigation. The data were organized and presented on the basis of soil associations shown on the general soil map and on an irrigation land classification map. Dona Ana County has about 2,434,600 acres, of which about 38 percent were considered suitable for irrigation. About 118,000 acres, of which about 38 percent were considered suitable for irrigation. About 118,000 acres were in irrigation class 1; 108,811 acres in class 2; 355,606 acres in class 3; and 347,560 acres in class 4. The remaining 1,504,623 acres in the county were in land class 6, which was not considered suitable for irrigation. Information is also provided on soil resources that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color, are included. (Creel-New Mexico)
W72-08881

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, SANTA FE COUNTY,
New Mexico Agricultural Experiment Station, University Park.
H. J. Maker, J. J. Folks, and J. U. Anderson.
Available from the National Technical Information Service as PB-209 760, $3.00 in paper copy, $0.95 in microfiche. New Mexico State University, Agricultural Experiment Station Research Report 185, 1971, 43 p, 5 fig, 8 tab, 7 ref. OWRR B-015-NMEX (8).

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Sante Fe County (NMex), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

Information is presented on the suitability of soils in Santa Fe County, New Mexico for irrigation. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. A general soil map and a detailed soil survey provided the information necessary for the classification for irrigation. The data were organized and presented on the basis of soil associations shown on the general soil map and on an irrigation land classification map. Santa Fe County has about 1,221,800 acres, of which about 43 percent were considered suitable for irrigation. About 2,643 acres were in irrigation class 1; 295,069 acres in class 2; 165,683 acres in class 3; and 57,095 acres in class 4. The remaining 701,310 acres in the county were in land class 6, which was not considered suitable for irrigation. Information is also provided on soil resources that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color, are included. (Creel-New Mexico)
W72-08882

IRRIGATION REGIMES IN A SEMI-ARID AREA AND THEIR EFFECTS ON GRAPEFRUIT YIELD, WATER USE AND SOIL SALINITY,
Volcani Inst. of Agricultural Research, Rehovot (Israel) and Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
H. Bielorai, and J. Levy.
Israel Journal of Agricultural Research, Vol. 21, No. 1, p. 3-12, January 1971. 5 fig, 3 tab, 8 ref.

Descriptors: *Irrigation practices, *Saline soils, *Saline waters, *Arid lands, *Root zone, *Crop response, Chlorides, Leaching, Irrigation efficiency, Water conservation, Salts, Citrus fruits, Grapefruit, Soil profiles, Soil types, Soil moisture.
Identifiers: *Negev Desert.

Citrus planing in Israel has shifted considerably from the cool coastal plain to warmer semiarid Negev regions. The shorter winter and lower rainfall all contribute to a need for a prolonged irrigation season for the orchards. The irrigation water available is scarce and high in salts (250 mg Cl/liter), with the result that leaching is often inadequate and salt accumulates in the profile. A 6-year irrigation experiment was initiated in 1963 in Gilat in the northern Negev, where the objectives were to evaluate the effect of various soil moisture regimes on tree and yield response in order to determine the optimal irrigation treatment and to determine the amount of soil accumulation in the profile. By the 6th year, yield was reduced 28% in the plots irrigated every 40 days in comparison to those irrigated every 18 days. Soil moisture status in the main root zone considerably affected the yield. Reduced application and rainfall resulted in 10% decreases in yield. Maximum yield was obtained when the seasonal water application was about 900 mm, given at a high frequency. In 3 seasons, mean Cl concentration in the soil profile had reached about 15 meq/liter in most plots. (Casey-Arizona)
W72-08888

WATER REQUIREMENTS OF AFRICAN GOATS AND HAIRED-SHEEP,
East African Veterinary Research Organization, Kabete (Kenya); and Harvard Coll., Cambridge, Mass. Museum of Comparative Zoology.
G. M. O. Maloiy, and C. R. Taylor.
Journal of Agricultural Science, Vol. 77, No. 2, p 203-208, October 1971. 2 fig, 1 tab, 7 ref.

Descriptors: *Xerophilic animals, *Water requirements, *Evaporation, *Physiological ecology, *Animal physiology, Arid lands, Domestic animals, Goats, Sheep, Grazing, Wildlife, Water balance, Habitats, Environmental effects, Temperature, Thermal stress, Moisture stress, Animal behavior, Laboratory tests.
Identifiers: *Ungulates, *Temperature regulation.

Gazelles, oryx, elands and other wild ungulates of arid and semiarid east Africa are able to exploit great areas of grazing land because they possess various physiological and behavioral adaptations which enable them to survive without drinking. High air temperatures and droughts are usual in these habitats. Domestic goats and haired-sheep are regularly watered by their herdsmen in these regions, but it is not clear as to whether this practice represents physiological need or traditional husbandry practices. Five Turkana goats and 5 Somali fat-tailed sheep, purchased from tribesmen of the arid northern Frontier Region of Kenya, were housed in metabolic cages and subjected to water balance and temperature regulation studies. Both species consumed, ad libitum, 8% of their body weight per day when water was freely available. When it was restricted, this figure decreased by 50%. Evaporation, the main avenue of water loss, fell from 6% of body weight per day to 3%. Body temperatures of the domestic animals were maintained constant under water stress. Domestic animals cannot utilize the behavioral adaptations of wild animals of grazing only at night because they are penned in at night. More importantly, since they do not seem to let body temperatures float upwards with ambient temperatures as wild animals do, resulting evaporation requirements are too high for survival without drinking. (Casey-Arizona)
W72-08889

THE RAJASTHAN CANAL PROJECT,
T. Loftas.
World Crops, Vol. 28, No. 1, p 20-23, January/February 1971. 14 fig.

Descriptors: *Irrigation canals, *Arid lands, *Saline soils, *Social aspects, *Economic impact, Political aspects, Land use, Land reclamation, Rainfall, Droughts, Foreign countries, Asia, United Nations.
Identifiers: *India, *Thar desert.

The Thar Desert of the Indian state of Rajasthan is 325 miles long and 27 miles wide and runs along the West Pakistan border. For much of the year, the temperature is 100-125 degrees F. and the mean annual rainfall is 6-10 inches. Droughts and famine are common and there is an old Rajasthani saying of 1 drought year in three and 1 famine year in eight. When completed, the Rajasthani Canal will stretch 291 miles through the state and bring 1.5 billion cu ft daily to the parched soils. The im-

pact on the state will be incalculable. FAO, which is carrying out the project, completed an aerial soil survey which revealed some unexpected large tracts of saline soil in projected canal irrigation areas; carefully planned reclamation programs will be initiated. The generally increasing realization of the necessity for cropping intensification in irrigation projects together with new high-yielding rice and wheat varieties could double the economic ceiling for irrigation investment to as much as 860 dollars/ha. New schemes such as this canal which open new areas to agriculture bring problems of social, economic and agricultural change that become inextricably combined. Because it would like to increase the scant desert population along the West Pakistan border, India will encourage a 20 fold increase. (Casey-Arizona)
W72-08891

ESTIMATING LEAF WATER CONTENT BY REFLECTANCE MEASUREMENTS,
Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research Div.
J. R. Thomas, L. N. Namken, G. F. Oerther, and R. G. Brown.
Agronomy Journal, Vol. 63, No. 6, p 845-847, November-December, 1971. 2 fig, 2 tab, 8 ref.

Descriptors: *Leaves, *Optical properties, *Moisture, *Turgidity, Regression analysis, Agronomic crops, Water balance, Laboratory tests, Cotton, Corn (Field), Plant morphology, Osmotic pressure.
Identifiers: *Reflectance, *Relative turgidity.

The effects of plant water stress on reflectance of light from leaves of several important agricultural crops were studied. Fully turgid leaves were allowed to air dry at about 20 deg. C. Before and after drying, the leaves were weighed and reflectance measurements were made. By repeating measurements at approximately the same location on the same leaves, the effects of factors such as variations in internal structure and thickness were minimized. Regression equations were developed expressing reflectance of incident light from upper leaf surfaces as a function of relative turgidity and water content. Internal leaf structure variations associated with water availability during growth resulted in low water status predictability from reflectance measurements. With cotton, the most clear reflectance measurements occurred in wilting leaves. Within the relative turgidity range, reflectance changes were less than normal variations. (Casey-Arizona)
W72-08892

DIURNAL CHANGES IN COTTON LEAF AND PETIOLE MOISTURE CONTENT AS RELATED TO ENVIRONMENTAL MOISTURE STRESS,
Texas A and M Univ., El Paso. Agricultural Research Station; and Texas A and M Univ., Pecos. Agricultural Research Station.
D. E. Longenecker, and P. J. Lyerly.
Agronomy Journal, Vol. 63, No. 6, p 885-886, November-December 1971. 1 fig, 1 tab, 12 ref.

Descriptors: *Cotton, *Leaves, *Water balance, *Agronomic crops, *Moisture content, Timing, Irrigation practices, Moisture stress, Environmental effects, Diurnal.
Identifiers: *Leaf water content, *Petioles.

The search continues in irrigated cotton production for some moisture-related plant condition for use as a criterion of when to apply water. Leaf properties, originally thought promising, appear unsuitable because leaf moisture fluctuates too rapidly on an hour-to-hour basis in response to changes in many environmental conditions. Reports of petiole suitability for such an irrigation criterion led to an attempt to investigate diurnal changes in petiole moisture and to correlate them with mature leaf moisture changes. Using gravimetric moisture determinations, four cotton varieties were studied - 2 upland and 2 American Pima. The data indicate that petiole is strongly related to the internal water balance of the plant on both a diurnal basis and with increasing environmental moisture stress. The fresh weight petiole moisture percentages were continuously higher than those of attached leaves. (Casey-Arizona)
W72-08893

INFLUENCE OF SOIL WATER STRESS ON EVAPORATION, ROOT ABSORPTION, AND INTERNAL WATER STATUS OF COTTON,
Texas A and M Univ., College Station. Dept. of Plant Sciences; and Agricultural Research Service, Temple, Tex. Soil and Water Conservation Research Div.
W. R. Jordan, and J. T. Ritchie.
Plant Physiology, Vol. 48, No. 6, p 783-788, December 1971. 5 fig, 32 ref.

Descriptors: *Leaves, *Stomata, *Soil-water-plant relationships, *Water balance, Resistance, Surfaces, Soil water, Canopy, Cotton, *Evapotranspiration, Plant physiology, Root zone, Texas, Drought tolerance, Solar radiation, Soil temperature, Energy budget, On-site investigations, *Moisture stress, Semiarid climates. *Plant water potential, *Soil water potential, *Relative water content.

Because of a prolonged drought in central Texas, the 1969 summer growing season provided an opportunity for field study of the water status of cotton under high soil water stress. The field study of water stress is important because field conditions are seldom as simple as laboratory situations, particularly because the soil water potential in the root zone rarely is uniform with depth. The results illustrate how a cotton crop may continue to extract water from the soil and transpire during periods of prolonged drought. Despite low soil water potential in the main root zone, significant plant evaporation rates were maintained. Absorption rates as functions of soil depth were maximal at the 75 cm level, well below the main root zone. Stomatal resistances stayed constant during the daylight hours at 2.5 sec/cm while leaf water potentials were approaching -30 bars. Continued extraction was made possible by the failure of the stomata to completely close in response to the low leaf water potentials. Stomatal sensitivity to decreased water potentials was much greater in greenhouse studies. (Casey-Arizona)
W72-08897

SPRINKLER TESTS IN CITRUS ORCHARDS,
Agricultural Research Inst., Tal-Amara (Lebanon). Dept. of Irrigation.
A. Aboukhaled, E. L. Kramer, and S. Sarraf.
Magon Institut de Recherches Agronomiques Liban, Technical Series, Publication No. 15, September 1971, 20 p. 2 fig, 5 tab, 15 ref.

Descriptors: *Sprinkler irrigation, *Citrus fruits, *Orchards, *Irrigation practices, *Irrigation efficiency, Testing, Irrigation systems, Arid lands, Limiting factors, Costs, Water resources, Crop production, Water loss, Water harvesting, Water conservation, Application methods, Water utilization, Farm management, Flow rates, Calibrations, Pressure, Winds, Sprays, Interception, Evaporation control, Water management (Applied), Operation and maintenance.
Identifiers: *Draghose systems, *Low angle sprinklers, Lebanon, Semi-arid lands.

High water use efficiency in irrigation is important in arid and semi-arid lands where water resources are limited and costly. Various sprinkler practices are evaluated in Lebanese citrus orchards to find methods of reducing water losses without reducing crop yields and to determine crop irrigation needs (consumptive use) for water optimization. Sprinkler methods give good control of water applications, as shown by the under-tree sprinkler systems tests in relatively young citrus plantations. Uniformity (Christiansen) coefficients, application rates, water losses and pattern efficiencies are given and discussed in relation to climatic, growing and operating conditions. Sprinkler flow rates are calibrated under various pressures and winds. Gross water losses (spray, interception and evaporation losses) are evaluated. Drag hose systems with low angle sprinklers is satisfactory and practical for irrigation of citrus orchards in Lebanon. Total water losses averaged 16 percent. Mean application rates ranged between 5.2 and 11.0 mm/hr. (Popkin-Arizona)
W72-08898

BEHAVIOR OF CORN AND SORGHUM UNDER WATER STRESS AND DURING RECOVERY,
Duke Univ., Durham, N.C. Dept. of Botany.
M. F. Sanchez-Diaz, and P. J. Kramer.
Plant Physiology, Vol. 48, No. 6, p 613-616, December, 1971. 3 fig, 36 ref.

Descriptors: *Corn, *Moisture stress, *Drought resistance, *Sorghum, *Stomata, Water balance, Leaves, Evapotranspiration, Resistance, Plant root systems, Plant physiology, Water requirements, Laboratory tests.
Identifiers: *Leaf water potential, *Leaf water saturation deficit.

Sorghum has long been considered one of the most drought-resistant crop plants. The reasons for this have been obscure, although many have felt that it is due to a superior root system, which has twice as many secondary roots per unit of primary root than less drought-resistant plants such as corn. Corn (Zea mays) and sorghum (Sorghum vulgare) were grown in controlled environment chambers which the roots completely filled. Therefore, differences in root system size were not a factor in these experiments. Water was withheld from the plants until they were badly wilted; they were then rewatered. At various points in water stress and after rewatering, stomatal resistance, leaf water potential and leaf water saturation deficit were measured. Corn stomata showed lower resistances and hence higher plant water losses than sorghum when the plants were well-watered. There was little difference in water potential in stressed plants. Thus, corn loses much more of its water before the stomata close in response to stress than does sorghum. This smaller ratio of leaf water content change to leaf water potential change is characteristic of drought-resistant species. (Casey-Arizona)
W72-08899

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES.
Agricultural Research Service, Washington, D.C. Soil and Water Research Div.
For primary bibliographic entry see Field 02B.
W72-08903

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: VERO BEACH, FLA.,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
For primary bibliographic entry see Field 02B.
W72-08905

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: TIFTON, GA.,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
For primary bibliographic entry see Field 02B.
W72-08906

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: KLINGERSTOWN, PA.,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 02B.
W72-08914

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: COTTONWOOD, S. DAK.,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 02B.
W72-08915

EVAPOTRANSPIRATION IN THE GREAT PLAINS.
For primary bibliographic entry see Field 02D.
W72-08920

EVAPOTRANSPIRATION AND SOIL CONSERVATION SERVICE IRRIGATION OPERATIONS,
Soil Conservation Service, Washington, D.C. Engineering Div.
For primary bibliographic entry see Field 02D.
W72-08922

RELATIONSHIP OF EVAPOTRANSPIRATION TO BUREAU OF RECLAMATION PROJECT PLANNING AND OPERATIONS,
Bureau of Reclamation, Washington, D.C. Div. of Water and Land Operations.
For primary bibliographic entry see Field 02D.
W72-08923

USE OF EVAPOTRANSPIRATION INFORMATION BY STATE WATER RESOURCE AGENCIES,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 02D.
W72-08925

IRRIGATION-ORIENTED ET MODELS FOR THE GREAT PLAINS,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 02D.
W72-08928

EVAPOTRANSPIRATION MODEL FOR DRYLAND CROPS FOR THE GREAT PLAINS,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02D.
W72-08929

EVAPOTRANSPIRATION COMPONENTS OF WATERSHED MODELS FOR THE GREAT PLAINS,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02D.
W72-08930

SOIL MODIFICATION FOR IMPROVING PLANT-WATER RELATIONS AND EFFECTS ON ET,
Agricultural Research Service, Sidney, Mont. Northern Plains Soil and Water Research Center.
For primary bibliographic entry see Field 02D.
W72-08932

ROLE OF PLANT CANOPIES IN EVAPOTRANSPIRATION,
South Dakota State Univ., Brookings.
For primary bibliographic entry see Field 02D.
W72-08937

EVAPOTRANSPIRATION AND THE AERIAL ENVIRONMENT AS INFLUENCED BY WINDBREAKS,
Agricultural Research Service, Manhattan, Kans. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02D.
W72-08938

STREAM DEPLETION BY WELLS IN THE SOUTH PLATTE BASIN--COLORADO,
Colorado Div. of Water Resources, Denver.
For primary bibliographic entry see Field 04B.
W72-08947

SOIL AND LEAF NUTRITIONAL STATUS OF COCOA PLANTINGS ON THE EAST AND WEST COASTS OF MALAYA,
Rubber Research Inst. of Malaya, Kuala Lumpur (Malaysia).
For primary bibliographic entry see Field 02G.
W72-08988

MODELLING WATER QUALITY FROM AGRICULTURAL LANDS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 06A.
W72-09077

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

MONITORING EARTH RESOURCES FROM AIRCRAFT AND SPACECRAFT,
California Univ., Berkeley. Forestry Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W72-08490

A PRELIMINARY VEGETATIONAL RESOURCE INVENTORY AND SYMPOLIC--LEGEND SYSTEM FOR THE TUCSON-WILLCOX-FORT HUACHUCA TRIANGLE OF ARIZONA,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 07B.
W72-08494

EVALUATION OF WILDLAND RESOURCES OF THE NASA BUCKS LAKE TEST SITE,
California Univ., Berkeley. Forestry Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W72-08495

A LAND-USE CLASSIFICATION SYSTEM FROM APOLLO 9 PHOTOGRAPHS FOR THE MISSISSIPPI-LOUISIANA AREA,
California Univ., Berkeley. Forestry Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W72-08496

STREAM REGIMEN AND MAN'S MANIPULATION,
Indiana Univ., Bloomington. Dept. of Geology.
R. V. Ruhe.
In: Environmental Geomorphology, Proceedings of 1st Annual Geomorphology Symposia Series, held at Binghamton, N Y, Oct 16-17, 1970: State University of New York at Binghamton, Publications in Geomorphology, p 9-23, August 1971. 7 fig, 1 tab, 8 ref.

Descriptors: *Channel improvement, *Erosion, *Flood control, *Channel erosion, *Environmental effects, Gully erosion, Sedimentation, Stream improvement, *Iowa, Missouri River, Floods, Water law, Regimen.
Identifiers: *Willow River (Iowa).

Straightening of Willow River, Iowa, was the direct cause for subsequent deep entrenchment and widening of that channel. A new gully cycle developed in tributaries and their drainage nets. Canyon-type gullies, deeply entrenched, extend many miles into surrounding countrysides. A new valley-slope gully and erosion cycle also was initiated. Flooding of the main valley was alleviated but gullying has disrupted agricultural land and public road transport nets. Conservation programs are now in operation in many of the tributary watersheds to control the gullying and hill-slope erosion. Engineering improvement of Missouri River not only alleviated flooding but created sizable land areas which are now utilized for agricultural and other practices. One unforeseen problem involved the ownership of land. Both cases illustrate the application of geomorphology to environmental control. When man manipulates the regimen of a stream, he should take into account all possible consequences of such manipulation and not focus his attention on only one problem. (See also W72-08510) (Knapp-USGS)
W72-08511

EFFECTS OF WATER TABLE HEIGHT ON SOIL AERATION AND CROP RESPONSE,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W72-08521

FLOODS OF MAY 1968 IN SOUTH ARKANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-08527

COVERING OPEN DISTRIBUTION RESERVOIRS,
Kramer, Chin and Mayo, Seattle, Wash.
For primary bibliographic entry see Field 08A.
W72-08535

A KINETIC MODEL OF PHYTOPLANKTON GROWTH, AND ITS USE IN ALGAL CONTROL BY RESERVOIR MIXING,
Municipal Waterworks of Rotterdam (Netherlands).
For primary bibliographic entry see Field 05C.
W72-08559

DEEP SEEPAGE ON PIEDMONT WATERSHEDS,
Clemson Univ., S. C. Water Resources Research Inst.
For primary bibliographic entry see Field 02F.
W72-08590

HIDDEN LAKE, FRESNO RIVER BASIN, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District. Sacramento, Calif.
For primary bibliographic entry see Field 08D.
W72-08629

HOLLOW CREEK WATERSHED PROJECT, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-08631

SPRING CREEK CHANNEL IMPROVEMENT, LOCAL FLOOD PROTECTION PROJECT, SPRINGDALE, ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.

Available from the National Technical Information Service as PB-198 744-F, $3.00 in paper copy, $0.95 in microfiche. October 28, 1971. 23 p, 1 map, 1 dwg.

Descriptors: *Arkansas, *Flood protection, *Channel improvement, *Flow control, Channeling, Streamflow, Flash floods, Flood frequency, Water management (Applied), Inter-agency cooperation, Excavation, Dikes, Landfills, Land development, Land reclamation, Wildlife habitats, Project planning, Project purposes, Urban renewal.
Identifiers: *Environmental impact statements, *Spring Creek (Ark), *Springdale (Ark).

The Spring Creek project will be located in Washington County, Arkansas and includes straightening and enlarging the Spring Creek channel to provide flood protection against a 50-year frequency flood for the city of Springdale. Excavated material from this channelization will be used to construct training dikes, extend the airport runway, and reclaim low areas of adjacent land. The proposed project has been coordinated with an urban renewal plan of the Urban Renewal Division, Department of Housing and Urban Development. Flood control benefits derived from the project include damage reduction, increased land use, advance replacement of existing improvements, and elimination of the threat of epidemics and other undesirable flood consequences. Unavoidable adverse environmental effects include removal or replacement of street and railway bridges, relocation of power and telephone lines, removal of some existing vegetation with resulting reduction in small game habitats, and elimination of songbird habitats. Various alternatives were rejected for either providing inadequate flood protection or more pronounced environmental impact. Comments of concerned agencies are included. (Blank-Florida)
W72-08633

MIAMI HARBOR, FLORIDA-NAVIGATION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.

Available from the National Technical Information Service as PB-204 838-D, $3.00 in paper copy, $0.95 in microfiche. November 1971. 9 p, 1 map, 1 append.

Descriptors: *Channel improvement, *Dredging, *Environmental effects, *Harbors, *Navigation, Excavation, Jetties, Project planning, Channels, Water quality, Turbidity, Aquatic habitats, *Florida, Spoil banks, Project benefits, Project purposes, Water pollution effects.
Identifiers: *Environmental impact statements, *Miami Harbor (Fla.).

A six-mile reach of the existing 30-foot Miami Harbor Project will be deepened to 36-38 feet. The channel between the jetties will also be widened by 100 feet for commercial navigation. Miami Harbor is located in Biscayne Bay, a shallow sound on the Atlantic near the southern end of Florida. About 5,000,000 cubic yards of material will be dredged from the existing channel and placed in two upland diked areas and three open-water disposal areas. Dredging will temporarily degrade water quality and destroy benthic invertebrates in bottom sediments and cover those in open-water disposal areas. Consideration was given to several alternative plans from 32-foot depth improvement to 38 feet. The proposed plan best serves the needs of deep-draft shipping at Miami Harbor. The project will have some adverse short-term enviornmental impact on marine habitats, but social gains from increased income and expanded tourism will be of long-term benefit. No irreversible commitments of resources are expected. (Horwitz-Florida)
W72-08635

MATAGORDA SHIP CHANNEL, TEXAS--MAINTENANCE DREDGING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.

Available from the National Technical Information Service as PB-204 666-D, $3.00 in paper copy, $0.95 in microfiche. November 15, 1971. 7 p, 1 map.

Descriptors: *Texas, *Environmental effects, *Channel improvement, *Dredging, Channel erosion, Hydraulics, Slopes, Spoil banks, Turbidity, Impaired water quality, Aquatic animals, Gulf of Mexico, Channels, Bays, Vegetation effects, Vegetation regrowth, Disposal, Landfills, Aquatic habitats, Water quality.
Identifiers: *Matagorda Ship Channel (Tex), *Environmental impact statements.

The Matagorda Ship Channel is a navigation project in Calhoun and Matagorda Counties, Texas. A deep-draft portion extends from the Gulf through Matagorda Bay, and the project involves dredging to maintain the channel at its authorized width of 300 feet and a depth of 38 feet. Spoil will be partially discharged in open Gulf waters and in existing disposal areas paralleling the channel. Environmental impacts include reduction in the possibility of marine accidents and groundings, coverage of vegetation on banks with spoil, disturbance of biological activity between the water and channel bottom, and temporary turbidity. Adverse impacts include the coverage of bank vegetation with spoil; however, this should regrow naturally. Temporary turbidity is unavoidable. Alternatives include foregoing dredging; however, navigability of the channel would then be lost. Alternative dredging and disposal schemes involve disposal in open waters and on land adjacent to the channel, dumping on land, and total disposal at sea. These alternatives are economically prohibitive. The project will induce no major change in short term environmental use and it will maintain local productivity. (Grant-Florida)
W72-08638

STARKWEATHER WATERSHED, NORTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-08640

COTTONWOOD CREEK DAM, IDAHO, PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 08D.
W72-08665

WATERLOO, IOWA, LOCAL PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 08A.
W72-08666

TYRONE, BLAIR COUNTY, PENNSYLVANIA--LOCAL FLOOD PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.

Available from the National Technical Information Service as PB-198 895-F, $3.00 in paper copy, $0.95 in microfiche. April 1971. 22 p, 1 map.

Descriptors: *Flood control, *Environmental effects, *Dredging, *Channel improvement, Project planning, Flood protection, Dikes, Floods, Floodwalls, Levees, Channels, Flumes, Project benefits, Treatment facilities, Turbidity, Water quality, Pennsylvania.
Identifiers: *Environmental impact statements, *Blair County (Pa.).

The flood control project is located on the Little Juniata River about 14 miles northeast of Altoona, Pennsylvania. The project is an integral part of a multi-agency metropolitan development project which includes the construction of a waste water treatment plant. The project will provide flood protection for commercial, municipal, and private buildings in Tyrone, Pennsylvania. Channelization will include dredging, flume construction, a diversion dike and tunnel, levees, and flood walls. Turbidity may increase during construction, but this is not expected to have a serious impact on water quality. No adverse impacts on fish and wildlife resources are expected. Up-stream flood control reservoirs were considered as alternatives and found impractical because of the number of streams and the scarcity of dam sites. Relocation of buildings in the flood plain is not practical. Flood protection will benefit the community by encouraging property improvement. There will be no sacrifice of long term productivity to benefit short term users. Irreversible commitments of resources will be limited to the labor and materials associated with construction. Comments of interested agencies are included. (Horwitz-Florida)
W72-08667

CORPUS CHRISTI SHIP CHANNEL, PORT ARANSAS BREAKWATER, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.

Available from the National Technical Information Service as PB-200 541-F, $3.00 in paper copy, $0.95 in microfiche. July 1, 1971. 23 p.

Descriptors: *Texas, *Breakwaters, *Channel improvement, *Harbors, *Environmental effects, Barriers, Coastal structures, Navigation, Ocean waves, Wind tides, Waves (Water), Channeling, Turbidity, Silts, Sedimentation, Economic impact, Project planning, Project purposes, Dredging, Aquatic habitats, Commercial fishing, Sport fishing.
Identifiers: *Environmental impact statements, *Port Aransas (Tex).

Under present conditions, wind and vessel generated waves enter Port Aransas Harbor. This causes extensive damage to vessels and mooring facilities and creates safety hazards in refueling and terminal operations. The project will provide a stone breakwater at the harbor entrance and will realign the connecting channel. The project's environmental impact includes wave protection, increases in harbor use by small commercial and pleasure crafe, direct benefits through a reduction in damage caused by wave action, safer navigation, and economic benefits through improved commercial and sport fishing. Unavoidable adverse environmental effects include short-term turbidity, siltation, and disturbance of marine organisms from the dredging of the proposed channel and the filling of the existing connecting channel. Various alternative breakwater designs and orientations were investigated, but the proposed plan represents the most feasible method to provide necessary protection. The comments of concerned agencies are included. (Blank-Florida)
W72-08668

NAVIGATION PROJECT, CATSKILL CREEK, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.

Available from the National Technical Information Service as PB-198 896F, $3.00 in paper copy, $0.95 in microfiche. May 1971. 26 p, 1 plate.

Descriptors: *Channel improvement, *Environmental effects, *Navigation, *Dredging, Channels, Project planning, Depth, Canal construction, Rivers, Navigable waters, Hudson River, Turbidity, Water quality, Wildlife habitats, Aquatic habitats, Project benefits, *New York.
Identifiers: *Environmental impact statements, *Catskill Creek (N.Y.).

The improvement plan provides for an 1800 foot flared entrance channel that will taper from a width of 250 feet at the 12 foot contour in the Hudson River to a width of 100 feet in Catskill Creek, all at a depth at mean low water of 12 feet. An inner channel 3500 feet in length, 10 feet wide, and 8 feet deep at mean low water will also be provided. The project will provide passage for recreational boats and tugs with tank barges. Channelization will be by hydraulic dredge methods with material disposal confined by retaining dikes. A temporary increase in water turbidity will occur during construction, but it will have a minimum impact on water quality. No adverse impacts upon fish and wildlife resources will result. The alternative considered was no development which would retain the existing environment with its increasing oil spill hazards for tank barges. Irreversible commitments of resources will be limited to construction labor. Comments of other agencies are included. (Horwitz-Florida)
W72-08669

BLUE EYE CREEK WATERSHED PROJECT, ALABAMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-199 875-F, $3.00 in paper copy, $0.95 in microfiche. September 1971. 44 p.

Descriptors: *Flood control, *Environmental effects, *Channel improvement, *Land management, Flood protection, Flooding, Levees, Structural engineering, Fisheries, Agriculture, Wildlife habitats, Land clearing, Flood plains, Flood plain zoning, Flood damage, Non-structural alternatives, Sedimentation, Floodwater, *Alabama, Land resources, Lakes, Recreation, Public health, Social impact.
Identifiers: *Environmental impact statements, *Taladega County (Ala), *Calhoun County (Ala).

The proposal involves land conservation treatment supplemented by two floodwater retarding structures and 9.2 miles of channel improvement in Taladega and Calhoun Counties, Alabama. Favorable effects include greater agricultural use of the flood plain and reduction of flood damage and related sanitation problems. The project will create a 25 acre lake fishery with a diverse recreational potential and allow establishment of bird habitats. Adverse effects include destruction of a stream fishery, elimination of 94 acres of wildlife habitat, removal of 25 acres from agricultural and wildlife use, interruption of such use in 145 acres, and reduction of farm and forest game. Alternatives considered include clearing and snagging the channel, construction of levees, flood plain zoning, and acquisition of flood prone areas. These alternatives were considered either more costly or less effective than the selected project. Comments of concerned agencies include an extensive response by the Environmental Defense Fund. (Ilkson-Florida)
W72-08671

LOS ESTEROS RESERVOIR, SANTA ROSA, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Albuquerque, New Mex.
For primary bibliographic entry see Field 08D.
W72-08672

SMALL FLOOD PROTECTION PROJECT ON MILL CREEK, KENTUCKY, OHIO RIVER BASIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.

Available from the National Technical Information Service as PB-202 653-F, $3.00 in paper copy, $0.95 in microfiche. June 1971. 17 p.

Descriptors: *Environmental effects, *Kentucky, *Channel improvement, *Flood protection, *Drainage programs, Watersheds (Basins), Flood control, Water management (Applied), Wildlife habitats, Environmental sanitation, Sanitary engineering, Impaired water quality, Pollutants, Public health, Channeling, Drains, Surface drainage, Turbidity, Project planning, Water resources development, Comprehensive planning, Project feasibility, Alternate planning, Federal project policy.
Identifiers: *Environmental impact statements, *Mill Creek (Ky).

To provide relief from floods occurring about one time every fifteen years, this small flood protection project consists of channel improvement and associated drainage improvements in the southwestern portion of Jefferson County, Kentucky. Due to the flat terrain, inadequate channel size, and restrictive bridges and culverts, flood discharge from the creek and its tributaries is inadequate. Beneficial environmental impacts of the proposed project include a higher level of flood relief and improved drainage control, reduced floods and flood duration with a concomitant reduction in potential health hazard caused by sewer discharges and contaminated water. Additionally, numerous bridges and culverts would be reconstructed or modified to upgrade the county and municipal road system within the project area. Approximately 3.5 miles of stream bank would be lost, adversely affecting the wildlife habitat. There would be moderate traffic control problems and increased turbidity during construction. The alternatives of no action, levee construction, and enlargement of the existing pumping plant were considered either impractical or not economically feasible. Draft statements were sent to federal, state and local agencies; their comments are included. (Blank-Florida)
W72-08673

MULTI-LEVEL OPTIMIZATION OF A RESERVOIR SYSTEM,
W. J. Trott, and W. W. G. Yeh.
Preprint, American Society of Civil Engineers Annual National Environmental Engineering Meeting, St. Louis, Mo. Oct 1971. 30 p, 5 ref, 3 tab, 12 ref, 2 append.

Descriptors: *Reservoirs, *Reservoir design, *Systems analysis, Size, Optimization, Reservoir operation, Dynamic programming, Numerical analysis, Algorithms, Cost-benefit analysis, Reservoir yield, Project planning, Operations research, Water demand, Cost-benefit ratio.
Identifiers: *Water resources systems, *Optimum design, *Systems engineering, Schematic diagrams, Cost curves.

A method is developed to determine the optimal design of any system of reservoirs with series and parallel connections. The general theory is described mathematically. Systems equations are given to describe the initial state of the system and the movement of water through it. The optimal design is obtained by maximizing the net benefits using a modified gradient procedure. For each set of reservoir sizes considered, the costs are computed from storage capacity vs. cost curves; benefits are determined by finding the optimal operating policy. The technique was applied to a 6-reservoir system and the numerical solution is given. The returns from the sample system were assumed to be derived from a firm water contract at a single demand point. This contract level was obtained by solving a 6-state variable dynamic programing problem which provided the optimal operating policy. (USBR)
W72-08757

BUFFALO CREEK AT MEADOW GROVE, NEBRASKA-LOUP RIVER FLOOD CONTROL PROJECT, COLUMBUS, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Neb.

Available from the National Technical Information Service as PB-202 081F, $3.00 in paper copy, $0.95 in microfiche. November 22, 1971. 28 p, 1 plate, 2 tab.

Descriptors: *Environmental effects, *Nebraska, *Channel improvement, *Flood control, *Stream improvement, Flood protection, Channeling, Channel flow, Channel morphology, Flood recurrence interval, Water management (Applied), Project planning, Project purposes, Wildlife habitats, Fisheries, Public health, Aesthetics, Check structures, River basins, Floodways.
Identifiers: *Environmental Impact Statements, *Buffalo Creek (Neb).

The project for channel improvement of Buffalo Creek at Meadow Grove, Nebraska involves channel enlargement and realignment to protect against floods having a 4% annual chance of occurrence and to reduce flood damage from more frequent storms. Environmental impacts of the proposed action include: reduction in flood damage, reduction of the threat of loss of life from floods, improvement of overall aesthetic and health conditions, reduction in the existing wildlife habitat, and reduction in the warm water fishery. The improved channel will replace the natural stream, thus eliminating some wildlife habitat and stream fishery due to construction. Alternatives to the action are flood plain zoning, flood proofing, evacuation, reservoirs, levees, channel diversion, and no development. Also included are comments of interested agencies. (Blank-Florida)
W72-08827

FLOOD CONTROL PROJECT, RONDOUT CREEK AND WALLKILL RIVER, NEW YORK AND NEW JERSEY; (SOUTH ELLENVILLE, N.Y.) RONDOUT CREEK BASIN, AND SANDBURG CREEK, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 08A.
W72-08828

SNAGGING AND CLEARING PROJECT, PAINT CREEK AT PAX, WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT),
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-201 671F, $3.00 in paper copy, $0.95 in microfiche. August 1971. 24 p.

Descriptors: *West Virginia, *Environmental effects, *Flood protection, *Channel improvement, Distribution patterns, Shape, Width, Sediment control, Stream improvement, Turbidity, Channeling, Running waters, Stage-discharge relations, Streamflow, Water conveyance, Project planning, Project purposes, Fish stocking, Aquatic habitats.
Identifiers: *Environmental impact statements, *Paint Creek (Va.).

Communities located along a two-mile reach of Paint Creek in southwestern Fayette County, West Virginia are subject to frequent floods which inundate highways and lowlying areas. The proposed project will remove obstructions from the Paint Creek channel to reduce flood stages at the community of Pax. The configuration of the streambed will be altered only where the accumulation of bars, snags, or debris is sufficient to restrict streamflow. The proposed project will increase channel discharge capacity resulting in an estimated annual reduction in flood damages of $10,200. The visual and habitat characteristics of the stream will be changed by the removal of riparian brush and trees. Unavoidable adverse environmental effects include temporary increase in stream turbidity during construction, elimination of trout stocking within the project area, and removal of cover for fish and wildlife habitat. Alternatives to the proposed action are channelization, construction of flood control reservoir, zoning, flood proofing, and no action. Comments of concerned agencies are included. (Blank-Florida)
W72-08829

BUFFALO CREEK AT MEADOW GROVE, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Nebr.

Available from the National Technical Information Service as PB-200 796F, $3.00 in paper copy, $0.95 in microfiche. October 1971. 23 p, 1 plate.

Descriptors: *Environmental effects, *Channel improvement, *Flood protection, *Nebraska, Bank erosion, River training, Bank stability, Flood control, Sediment control, Channels, Wildlife habitats, Aquatic habitats, Fish management, Public health, Social aspects, Construction costs.
Identifiers: *Environmental Impact Statements, *Buffalo Creek (Neb.), *Elkhorn River (Neb.).

The project involves channel enlargement and realignment of Buffalo Creek, at Meadow Grove, Nebraska, to protect against floods. The project is 5,900 feet in length. The channel has a low-flow width of 20 feet at 4 foot depth. The basin area is characteristically farm land. The Creek drains into the Elkhorn River. Environmental impacts consist of a reduction in property flood damage, general improvement of aesthetic and health conditions, reduction in existing wildlife habitat and of the warm water fishery in the Creek's lower reach, and loss of the natural stream's aesthetic quality. Adverse impacts consist of loss of animal habitats due to construction and tree removal; however, this is not too serious because the habitats are not extensive. A downstream fishing loss may occur through silting, but this may only be temporary. Alternatives include dam construction, levee construction, and floodproofing. These all are either too costly or ecologically disadvantageous. Flood plain zoning already exists. No change in short-term land usage is expected, and long-term land productivity should increase. Comments of concerned agencies are included. (Grant-Florida)
W72-08836

YELLOW CREEK PORT PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Chattanooga.

Available from the National Technical Information Service as PB-198 738-F, $3.00 in paper copy, $0.95 in microfiche. November 30, 1971. 50 p, 4 fig, 12 append.

Descriptors: *Social impact, *Environmental effects, *Mississippi, *Tennessee Valley Authority, *Harbors, *Channel improvement, Regional economics, Economic impact, Engineering structures, Port authorities, Water quality, Land use, Dredging, Industries, Docks.
Identifiers: *Environmental Impact Statements, *Yellow Creek Port (Tenn.).

The Yellow Creek Port project is a cooperative undertaking by the Tennessee Valley Authority (TVA), the State of Mississippi, and local government agencies for building and developing a river port terminal and related industrial complex on the Yellow Creek Embayment of Pickwick Landing Reservoir located on the Tennessee-Tombigbee Waterway in northeast Mississippi. The purpose is to provide for economic development in an area characterized by a low standard of living and an underutilization of human and natural resources. The primary impact will be on the use of 2,000 acres of rural land for industrial development, on water quality from construction activities and any spillage of cargo at the dock, and on air quality from construction activities and any discharges from industries locating in the area. Adverse environmental effects are temporary and result from construction. The land use change is not considered significantly adverse, since the change involves a more productive use. Alternate sites were examined, but the present one was clearly superior because of water depth, land base, and existing land use. Comments of concerned agencies are included. (Nielsen-Florida)
W72-08845

CHOPTANK RIVER, CAROLINE COUNTY, MARYLAND (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer, District, Baltimore, Md.

Available from the National Technical Information Service as PB-203 687D, $3.00 in paper copy, $0.95 in microfiche. October 9, 1970. 30 p, 4 map, 13 tab.

Descriptors: *Environmental effects, *Maryland, *Channel improvement, *Dredging, *Navigation, Transportation, Channel flow, Depth, Width, Turbidity, Suspension, Water pollution effects, Sediment discharge, Suspended solids, Silting, Morbidity, Fish eggs, Spoil banks, Disposal, Project planning, Project purposes, Wildlife habitats, Excavation, River training.
Identifiers: *Environmental Impact Statements, *Choptank River (Md).

The proposed project would provide a navigation channel in the Choptank River from Pealiquor Shoals to Denton, Maryland. Construction will involve approximately 2 miles of dredging as well as placement of spoil material behind earthen dikes. Environmental impacts of the proposed project include temporary siltation and sedimentation caused by hydraulic dredging, disruption of land and resident wildlife in the disposal area, and some long-term enhancement of both commercial and recreational boating due to the presence of the channel. Unavoidable adverse effects will result from increased turbidity and spoil disposal. To avoid destruction of eggs and young fish from turbidity and silting, it is recommended that the contract specify a dredging period exclusive of spawning months. Alternatives are 'no development' and lesser channel dimensions. A draft environmental impact statement was sent to various governmental agencies and summaries of their comments are included. (Blank-Florida)
W72-08849

MT. ELBART PUMPED-STORAGE POWERPLANT FRYING PAN-ARKANSAS PROJECT, COLORADO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 08C.
W72-08850

MISSISSIPPI RIVER, EAST BANK, WARREN TO WILKINSON COUNTIES, MISSISSIPPI, VICKSBURG- YAZOO AREAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Vicksburg, Miss.

Available from the National Technical Information Service as PB-204 968D, $3.00 in paper copy, $0.95 in microfiche. December 1, 1971. 28 p, 1 map, 5 tab, 1 chart.

Descriptors: *Mississippi, *Environmental effects, *Flood protection, *Levees, Mississippi River Basin, River basins, Flood plains, Floodgates, Drainage systems, Pumping plants, Wildlife habitats, Aquatic habitats, Recreation, Wetlands, Wildlife conservation, Drainage effects, Engineering structures, Non-structural alternatives, Cultivated lands, Adoption of practices.
Identifiers: *Environmental Impact Statements, *Yazoo River (Miss).

The project involves construction of 11.3 miles of protective loop-levee with related interior drainage and pumping facilities to provide protection to 10, 100 acres of flood plain along the Yazoo River. The project area consists of farmland, southern bottomland hardwoods, and commercial and residential land. Environmental effects of the project include improved living conditions for area residents, damage to wildlife due to conversion of 4,300 acres of woodland to cropland, damage to fishery resources by elimination of natural overflow, flood protection for 10, 100 acres of historic floodland, and loss of hunting and fishing recreation. Adverse impacts include extensive alteration of natural water-forest habitats due to woodland conversion and reduced water levels. In order to mitigate against this permanent loss a 1,000-acre green tree reservoir will be acquired within the area to preserve wildlife and fish habitats. Alternatives considered include two alternate levee alignments which are less cost effective, and non-structural alternatives which are inadequate to provide the necessary protection. Environmental advantages of no development were insufficient, since the habitats would likely be lost eventually regardless of the project. (Grant-Florida)
W72-08853

FIELD MEASUREMENTS IN THE DRAINAGE BASIN,
Exeter Univ. (England). Dept. of Geography.
K. J. Gregory, and D. E. Walling.
Geography, Vol. 56, No. 253, p. 277-292, November 1971. 8 fig, 32 ref.

Descriptors: *Geomorphology, *Drainage patterns (Geologic), *Hydrologic cycle, *Demonstration watersheds, *Education, Hydrologic equation, River basins, Sedimentology, Hydrology, Land forming, Environmental effects, Drainage density, Hydrogeology, Streams, Running water, Terrain analysis, Slopes, Measurement.
Identifiers: *Catchments.

The problems of teaching geomorphology stem, in part, from the problems of outlook which exist within the field. Should one concentrate on the description of landforms or on the evolutionary processes which fashion the landscape. The resolution of this dilemma will be achieved when studies of contemporary processes of development can be utilized in the study of landforms and when information from the 2 fields can be integrated much more completely. The recent growth of geomorphology has been paralled by increased research and substantial success in related fields such as hydrology and sedimentology, which are fields that have much to offer in the interpretation of contemporary geomorphological processes. The drainage basin is now generally acknowledged to be a fundamental unit of study in fluvial geomorphology. It provides many opportunites to devise and to expedite fieldwork projects which illustrate the character and complexity of fluvial processes. Such a system may be envisaged as having 4 main components: input, interaction with basin characteristics, losses and output. Specific examples of the various components are described and include field measurements performed with simple equipment while demonstrating the complexity of the dynamics of physical landscape and the difficulties inherent in its study. (Casey-Arizona)
W72-08884

THE RAJASTHAN CANAL PROJECT,
For primary bibliographic entry see Field 03F.
W72-08891

THE RIVER NILE ECOLOGICAL SYSTEM: A STUDY TOWARDS AN INTERNATIONAL PROGRAMME,
Cairo Univ., Giza (Egypt). Dept. of Botany.
For primary bibliographic entry see Field 06G.
W72-08894

THE USE OF EVAPOTRANSPIRATION INFORMATION IN THE FOREST SERVICE,
Forest Service (USDA), Denver, Colo. Rocky Mountain Region.
For primary bibliographic entry see Field 02D.
W72-08924

AN EVAPOTRANSPIRATION MODEL FOR GREAT PLAINS GRASSLANDS,
Texas A and M Univ., College Station. Dept. of Range Science.
For primary bibliographic entry see Field 02D.

W72-08927

A HYDRAULIC MODEL FOR THE SIMULATION OF NON-HYSTERETIC VERTICAL UNSATURATED FLOW OF MOISTURE IN SOILS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 02G.
W72-08942

DERIVATION OF HYDROLOGIC FREQUENCY CURVES,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 02A.
W72-08951

LA FARGE LAKE, KICKAPOO RIVER, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District. St. Paul, Minn.

Available from the National Technical Information Service as PB-204 918D, $6.00 in paper copy, $0.95 in microfiche. September 17, 1971. 523 p, 2 fig, 4 plate, 4 map, 42 tab, 20 ref.

Descriptors: *Flood protection, *Environmental effects, *Multiple-purpose reservoirs, Wisconsin, Organizations, Administrative agencies, Flood control, Fish management, Wildlife conservation, Recreation, Channel improvement, Flood plain zoning, Land management, Wildlife habitats, Project purposes, Project planning, Dam construction.
Identifiers: *Kickapoo River (Wis.), *Environmental Impact Statements.

The proposed plan consists of a multiple-purpose lake for flood control, enhancement of fish and wildlife resources, and recreation; possible future channel enlargement at downstream points; and local flood protection works at certain downstream communities. Most of the existing flood plain will be submerged for a distance of about 12 miles upstream from the dam. Of the 1,780 acres that would be dedicated to the project, about 1,400 acres would be used for recreational development. The formation of the lake could cause some changes in the water table, affect artesian pressures, and create wet or unstable areas. Plant life will be lost to create the conservation pool. Reservoir banks between conservation pool level and the top of the flood control pool will be subject to periodic inundation. Due to existing marginal wildlife habitats, only limited wildlife losses are expected. Numerous alternatives were considered. Comments were requested from appropriate state, federal, and private organizations. (Waldron-Florida)
W72-09032

SMALL FLOOD PROTECTION PROJECT, NORTH FORK, NOLIN RIVER HODGENVILLE, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.

Available from the National Technical Information Service as PB-198 903F, $3.00 in paper copy, $0.95 in microfiche. May 1971. 12 p, 1 tab.

Descriptors: *Flood control, *Channel improvement, *Flood protection, *Environmental effects, Administrative agencies, Projects, Flood plains, Levees, Riparian rights, Wildlife conservation, Banks, Streams, Headwaters, Turbidity, Water pollution effects, Fish, Urbanization, Federal government, Water resources development, State governments, *Kentucky, Aquatic habitats, Wildlife habitats.
Identifiers: *Nolin River (Ky.), *Environmental Impact Statements.

The local flood control project is intended to clear the headwater flood channel and streambank undergrowth, by selective clearing and snagging. The stream flows through Hodgenville, Kentucky. The left bank is primarily urban, and the right bank is primarily farmland. Both banks are covered with brush and various sized trees. The stream is polluted by livestock feeding operations, outdoor sanitary facilities, and refuse from urban businesses. Consequently, fish and wildlife values are low. The project would reduce headwater flooding, improve the quality of life, and increases the productive capability of adjoining farmland. The project will remove some habitat for both terrestrial and aquatic life. The project is expected to temporarily increase turbidity and increase the possibility of urbanization in presently open areas. Since flood damages are small, levees and upstream lakes are not feasible. The 'no-action' alternative would result in the loss of $1,800 in annual benefits. Comments of interested agencies are included. (Waldron-Florida)
W72-09033

THE NAVIGATION PROJECT, BRISTOL MARINA, DELAWARE RIVER, BUCKS COUNTY, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.

Available from the National Technical Information Service as PB-199 452F, $3.00 in paper copy, $0.95 in microfiche. May 1971. 43 p, 2 plate, 1 photo.

Descriptors: *Environmental effects, *Marinas, *Delaware River, *Boating, *Dredging, *Pennsylvania, Rivers, Recreation demand, Recreation facilities, Recreation wastes, Recreation, Turbidity, Water quality, Project benefits, Fish, Anadromous fish, Catadromous fish, Oil pollution, Economics, Docks, Water pollution sources, Water sports, Aquatic habitats.
Identifiers: *Bristol Marina (Pa.), *Environmental Impact Statements.

This project will provide much needed berthing for small craft. The plan includes an entrance channel, an access channel, and two sheet pile breakwaters. The site is within the Philadelphia metropolitan area. At present the area consists of a drainage ditch and small swamp, having no useful purpose or recreational value and possessing poor natural and aesthetic qualities. The berthing and service facilities would provide economic stimulus. The project would replace the blighted conditions in an old, historic site by making the area an attractive element of a larger park and recreational development. No adverse effects upon fish and wildlife would result. Oil pollution due to increased boating will be minimized. Dredging will create a temporary increase in turbidity, but dredging will be performed and timed to minimize interference with passage of anadromous and catadromous fish. The chosen site has the lowest construction cost and possesses some historical significance. There were no appreciable differences in the environmental impact of alternative sites. No action would fail to alleviate the unsatisfied needs of small boat owners. The marina would enhance local short-term environmental use. Fifteen acres of swamp and mudflat would be destroyed. Agency responses, two maps, and a photograph of the area are included. (Ilkson-Florida)
W72-09034

CHENA RIVER LAKES FLOOD CONTROL PROJECT, FAIRBANKS, ALASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 08D.
W72-09035

SAN ANTONIO CHANNEL IMPROVEMENT, SAN ANTONIO RIVER AND TRIBUTARIES, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 08A.
W72-09041

FORT MYERS BEACH CHANNEL, FLORIDA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.

Available from the National Technical Information Service as PB-199 611F, $3.00 in paper copy, $0.95 in microfiche. October 11, 1971. 35 p, 1 plate, 4 tab.

Descriptors: *Florida, *Channel improvement, *Dredging, *Coastal engineering, Excavation, Navigation, Shore protection, Open channels, Inlets (Waterways), Turbidity, Coasts, Beach erosion, Coastal structures, Shores, Bottom sediments, Project planning, Project purposes, Aquatic habitats, Commercial fishing, Regional economics, Cost-benefit ratio.
Identifiers: *Environmental Impact Statements, *Fort Myers Beach (Fla).

This project would extend the existing navigation channel about 2000 feet easterly to accommodate commercial facilities. 40,000 cubic yards of material would be dredged with a benefit-cost ratio computed at 1.7 to 1. The extension will provide needed vessel maneuvering space while the excavated material will be pumped to a badly eroded beach. Extension of the channel will also lessen the chance of collisions or grouding which could cause serious oil pollution. IUnavoidable adverse effects include the destruction of approximately 7 acres of existing bottom environment, temporary water turbidity, and alteration of gulf bottom by fill placement. The only practical alternative is to abandon the project; however, failure to complete the project could result in abandonment of project-related commercial and industrial establishments. Except for the loss of limited quantities of marine life, no irreversible or irretrievable commitments of resources is expected from the proposed construction. Comments of interested agencies are included. (Blank-Florida)
W72-09042

GREAT LAKES CONNECTING CHANNELS--WIDENING AND DEEPENING BENDS IN ST. MARYS RIVER, MICHIGAN--PHASE I (FINAL ENVIRONMENTAL IMPACT STATEMENT).
United States Lake Survey, Detroit, Mich.

Available from the National Technical Information Service as PB-199 855F, $3.00 in paper copy, $0.95 in microfiche. September 24, 1971. 85 p, 1 map, 1 tab.

Descriptors: *Environmental effects, *Channel improvement, *Dredging, Navigation, Project purposes, Project benefits, Navigable rivers, Spoil banks, Great Lakes, Excavation, Silting, Turbidity, Water quality, Water pollution, Nutrients, Bank erosion, Aquatic life, Aquatic environment, Channels, Recreation, Fish populations, Water resources development, United States, Canada, Lake Huron, Lake Superior.
Identifiers: *St. Marys River (Mich.), *Environmental Impact Statements.

The project consists of widening six channel bends in the St. Marys River to improve navigation between Lake Huron and Lake Superior. This is expected to stimulate utilization of the channel by larger ships. The project will result in a six acre enlargement of an existing island from disposal of dredged material. There will be fish kills due to blasting, turbidity, siltation, and nutrient releases. The disposal island will disrupt the aquatic life of six acres of river bottom. The increased wave wash from use of the channel by larger vessels may contribute to shore erosion problems. Alternatives include: use of tugboats to assist larger

vessels, restriction of larger ships from the channel, and alternative methods of spoil disposal. While water quality and recreation will temporarily suffer from the project, the long-term effects of the operation cannot be accurately predicted. Construction of the disposal island may have long-term recreation benefits and the channel improvement will provide for easier and safer passage of larger vessels. Comments from interested agencies are included. (Brackins-Florida)
W72-09043

RAILROAD CLOSURE STRUCTURE, BEACH CITY LAKE, SUGAR CREEK, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08D.
W72-09054

HOUSTON SHIP CHANNEL, TEXAS-MAINTENANCE DREDGING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.

Available from the National Technical Information Service as PB-205 336-D, $3.00 in paper copy, $0.95 in microfiche. December 10, 1971. 9 p, 1 map.

Descriptors: *Environmental effects, *Texas, *Channel improvements, *Dredging, Channels, Benthic fauna, Benthic flora, Turbidity, Suspension, Impaired water quality, Ships, Anaerobic conditions, Spoil banks.
Identifiers: *Environmental Impact Statements, *Houston Ship Channel (Tex).

The project involves removal and disposal of shoaled materials to preserve and maintain the ship channel into Houston, Texas. The growth of Houston since channel construction in 1914 has brought increased industrialization and shipping. The area serves as both a major deepwater commercial port and a recreational port. The project will benefit man's environment through preservation of low cost marine transportation facilities. The area's economy is dependent on the channel. The removal of shoal materials will remove or disturb some benthic and motile organisms. However, the upper portion of the channel is a low quality aquatic habitat. This limits significant ecological effects. Short-term localized turbidity will result from dredging and disposal activities. Malodorous gases and unsightly conditions will also result. This should be alleviated through control measures and natural processes. Alternatives range from foregoing the maintenance, leading to severe economic losses, to disposal in leveed areas in open water, resulting in expensive levee construction and maintenance. (Nielsen-Florida)
W72-09055

BROOMFIELD, COLORADO WATER TRANSMISSION LINE, PROJECT WSP CO-08-00-0110, BROOMFIELD, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of Housing and Urban Development, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 08C.
W72-09056

CORTE MADERA CREEK FLOOD CONTROL PROJECT, MARIN COUNTY, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 08A.
W72-09057

OPTIMAL DESIGN AND OPERATION OF WATER RESERVOIRS,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
E. S. Lee.

Completion Report, January 1972. 155 p, 50 fig, 24 tab, 13 ref, 3 append. OWRR C-1649 (No 3152) (1).

Descriptors: *Model studies, *Optimization, *Water resources, *Multiple-purpose reservoirs, Flood control, Design, Management.
Identifiers: *Gradient projection method, *Conjugate gradient method, *Walnut River (Kans), *Poteau River (Okla).

The problem considered is the simultaneous optimization of the initial design and the operating policy over the life of multiple reservoir systems with multiple purposes. The approach is based on the division of the reservoir into two imaginary water storage pools, namely the conservation pool and the flood control pool. The conservation pool is used for the storage of water for various uses such as water supply, water quality control, recreation, and fish and wildlife conservation. In order to define these two imaginary pools and to satisfy the pools' purposes, the concepts of lagrange multiplier and parameter optimization are used. Two different systems, namely the Walnut River basin and the Poteau River basin, are used to demonstrate the approach. The data used for these two systems are furnished by the Corps of Engineers and the Kansas Water Resources Board. Two recent versions of the nonlinear programming technique, namely the generalized reduced gradient technique and the gradient projection technique, are used to obtain the optimum of the water resources model.
W72-09062

THE SERIAL CORRELATION IN A SIMPLE DAM PROCESS,
Goteborg Univ. (Sweden).
For primary bibliographic entry see Field 06A.
W72-09067

ALTERNATIVE APPROACHES TO WATER RESOURCE SYSTEM SIMULATION,
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
For primary bibliographic entry see Field 06A.
W72-09079

WATER RESOURCES SYSTEMS ANALYSIS,
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06A.
W72-09085

A HISTORY OF THE LAKE-WEED INFESTATION OF THE ROTORUA LAKES AND THE LAKES OF THE WAIRATA HYDRO-ELECTRIC SYSTEM,
Auckland Univ. (New Zealand).
V. J. Chapman.
N Z Dep Sci Ind Res Inform Ser. 78: 5-52. 1970. Illus. Maps.
Identifiers: Electric, Fishery, Herbicides, History, Infestation, Lakes, Management, New Zealand, Rotorua, System, Trout, Wairata, Weed.

The problems involved in weed control using herbicides and management of the lake areas in order to maintain a balanced ecosystem essential to the trout fishery and other lake resources are discussed.--Copyright 1971, Biological Abstracts, Inc.
W72-09135

4B. Groundwater Management

WATER RESOURCES OF DORCHESTER AND TALBOT COUNTIES, MARYLAND,
Geological Survey, Parkville, Md.
F. K. Mack, W. E. Webb, and R. A. Gardner.
Maryland Geological Survey Report of Investigations No 17, 1971. 107 p, 39 fig, 16 tab, 47 ref, append.

Descriptors: *Water resources, *Groundwater, *Surface waters, *Maryland, *Hydrologic data, Basic data collections, Water yield, Water quality, Salinity, Chesapeake Bay, Groundwater recharge, Aquifer characteristics, Water wells, Transmissivity, Water users, Streamflow, Water supply, Projections, Water levels, Chemical analysis, Hydrographs.
Identifiers: *Dorchester County (Md), *Talbot County (Md).

Groundwater is abundant in and near Dorchester and Talbot Counties, Maryland, but fresh surface-water supplies are not readily available. Water in streams in the nontidal areas and in the explored aquifers is satisfactory for most purposes. However, water in Chesapeake Bay and most of the tidal reaches of its tributaries is too saline for a water supply. The groundwater resources near Cambridge and Easton are adequate for present needs, and should supply anticipated demand until at least the year 2000. Groundwater is available from two sources: (1) water in the artesian aquifers (transmissibility of 30,000 to 45,000 gpd per ft) (2) water in the shallow groundwater reservoirs that are subject to local replenishment by precipitation. Water use (excluding withdrawals for cooling electric power generators) totaled 11 mgd in 1960. Pumpage of groundwater averaged 10 mgd, and pumpage of surface water, mainly for irrigation, averaged 1 mgd. (Woodard-USGS)
W72-08500

GROUND-WATER CONDITIONS DURING 1970 IN INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. H. Koehler.
Geological Survey Open-file Report, November 26, 1971. 19 p, 5 fig, 4 tab, 5 ref.

Descriptors: *Groundwater, *Hydrogeology, *Water wells, *Water quality, *Hydrologic data, California, Basic data collections, Water level fluctuations, Withdrawal, Pumping, Water yield, Aquifers, Groundwater recharge, Hydrographs, Chemical analysis, Water supply.
Identifiers: *Indian Wells Valley (Calif).

Water-level measurements were made in about 130 wells in Indian Wells Valley, California, in 1970. The average water-level decline in six wells in the intermediate area between September 1969 and October 1970 was 1.8 feet. This is 0.4 foot less than the average decline in the same wells the previous year. The water-level decline in the Inyokern area was greater than in previous years. The water level in the Ridgecrest area did not change significantly in 1970. The total pumpage from Indian Wells Valley during 1970 was about 14,000 acre-feet, an increase of about 4 percent over 1969. Thirty-six water samples were collected from 24 wells in Indian Wells Valley in 1970 for chemical analysis. This water used by the Naval Weapons Center is low in dissolved-chemical constituents and has not changed significantly since 1962. Water samples from 4 wells owned by Indian Wells Valley County Water District had higher dissolved-solids concentrations than samples from the same wells in 1959. (Woodard-USGS)
W72-08505

GEOLOGY AND GROUND-WATER SYSTEM IN THE GILA RIVER PHREATOPHYTE PROJECT AREA, GRAHAM COUNTY, ARIZONA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 03B.
W72-08509

AQUIFER PERFORMANCE TESTS UNDER TWO-PHASE FLOW CONDITIONS,
Alabama Univ., University. Natural Resources Center.
For primary bibliographic entry see Field 02F.
W72-08591

STATE MANAGEMENT OF GROUND WATER MINING: A SYSTEM BASED ON POLICY, FACT AND THEORY; FUNDINGSLAND V. COLORADO GROUND WATER COMM., 468 P. 2D 835 (COLO. 1970),
For primary bibliographic entry see Field 06E.
W72-08763

IRON AND MANGANESE REMOVAL BY SPLIT FLOW TREATMENT,
Eau Claire Dept. of Public Works, Wis.
For primary bibliographic entry see Field 05F.
W72-08856

WATER CONSERVATION BY BARRIER INJECTION,
Nassau County Dept. of Public Works, Long Island, N.Y.
For primary bibliographic entry see Field 05G.
W72-08861

THE EFFECT OF ORGANIC MATERIALS ON IRON REMOVAL IN GROUND WATER,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 05F.
W72-08869

IRON AND MANGANESE PRECIPITATION IN LOW ALKALINITY GROUNDWATERS,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 05F.
W72-08872

STREAM DEPLETION BY WELLS IN THE SOUTH PLATTE BASIN--COLORADO,
Colorado Div. of Water Resources, Denver.
J. A. Danielson, and A. R. Qazi.
Water Resources Bulletin, Vol 8, No 2, p 359-366, April 1972. 5 fig, 1 tab, 3 ref.

Descriptors: *Conjunctive use, *Colorado, *Return flow, *Surface-groundwater relationships, *Irrigation wells, Irrigation water, Alluvium, Base flow, Water rights, Prior appropriation.
Identifiers: *South Platte Basin (Colo).

Drought conditions combined with improved well technology resulted in a large amount of well development in the South Platte valley of Colorado during the period 1952-56. These wells were used for supplemental supply in many cases, but the application of sprinkler irrigation brought many acres of dry land into irrigated production. As a result of the groundwater withdrawal, senior surface appropriators found a decreasing amount of water available in the streams. The legislature, observing the doctrine of prior appropriation, ruled that all surface and groundwater in a tributary would be treated and administered as one resource. Analysis of a segment of the river was made with careful determination of all inflow and outflow in the study reach to include correlations required to determine ungaged side-channel inflow and unmetered irrigation wells. Wells have intercepted normal return flows to the river resulting in a decreased amount of surface water during the irrigation season. Stream depletion appears to equal the expected consumptive use of well water which ranged between 40% to 50% of the groundwater extraction. (Knapp-USGS)
W72-08947

NONSTEADY FLOW TO A WELL WITH TIME DEPENDENT DRAWDOWN,
Wisconsin Univ., Milwaukee. Dept. of Civil Engineering.
R. A. Williams, R. Y. Lai, and G. M. Karadi.
Water Resources Bulletin, Vol 8, No 2, p 294-303, April 1972. 6 fig, 7 ref.

Descriptors: *Groundwater movement, *Unsteady flow, *Artesian aquifers, *Drawdown, Water yield, Transmissivity, Aquifer characteristics, Mathematical studies, Water levels, Water table, Aquifer testing, Specific capacity, Confined water.

Confined flow toward a single well of finite radius in an extensive aquifer of uniform transmissibility was studied under the assumption of time-dependent drawdown. Three particular cases were considered: (a) linear drawdown (including constant drawdown; (b) exponential drawdown; (c) periodic (sinusoidal) drawdown. The differential equation governing unsteady axial symmetric flow toward a single well in a confined aquifer was solved for the three different situations by the use of the Laplace transform method. The resulting expressions are integrated by adapting a modified Gemant scheme. General computer programs were developed and operated for several combinations of characteristics. The results were plotted to show the effect of time dependent drawdown on the variation of the well discharge and the piezometric head distribution. (Knapp-USGS)
W72-08949

A SYSTEMS STUDY OF FUTURE GROUNDWATER DEVELOPMENT COSTS IN THE CHICAGO REGION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 06B.
W72-08972

HYDROGEOLOGY OF THE USSR, VOL 13: THE VOLGA-KAMA RIVER REGION (GIDROGEOLOGIYA SSSR. TOM XIII. POVOLZH'YE I PRIKAM'YE).
For primary bibliographic entry see Field 02F.
W72-09006

PROCESS FOR COLLECTING AND STORING FRESH WATER IN EARTH,
For primary bibliographic entry see Field 03B.
W72-09021

GEOTHERMAL LEASING PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.

Available from the National Technical Information Service as PB-203 102D, $3.00 in paper copy, $0.95 in microfiche. September 1971. 58 p, 3 fig, 2 append.

Descriptors: *Environmental effects, *Geothermal studies, *Water resources development, Natural resources, Groundwater, Groundwater resources, Groundwater mining, Project purposes, Project benefits, Geology, Energy, Electric power production, Water resources, Regulation, Land use, Water quality, Waste water (Pollution), Water pollution, Water pollution control, Wildlife habitats, Land subsidence, Federal government, Saline water, Fish, Silting.
Identifiers: *Environmental Impact Statements, *Geothermal resources, Geothermal Steam Act of 1970, National Environmental Policy Act.

The major federal action involved is the leasing for development of federally owned geothermal resources. Geothermal reservoir systems are of two main types: vapor dominated systems and hot-water systems. Because of the wide geographical distribution of the lands involved, the extreme range of ecological and geological factors involved, and limited experience in geothermal resource development, only a general description of potential environmental effects is made. Environmental effects on the land and land use, surface water, groundwater and the geothermal reservoirs are included. These effects are outlined at six stages of development: exploration, test drilling, production testing, field development, powerplant and power-line construction, and full scale operations. The only alternatives would be postponement or refusal to develop the energy resources; however, energy needs would have to be met from other sources such as fossil fuel plants which could have a greater impact on the environment. Proposed rules for leasing and operation of the projects are included. (Brackins-Florida)
W72-09044

FINDING NATURAL RECHARGE PATTERNS AND ABSTRACTION PHASES TO MAXIMISE YIELD OF AQUIFERS,
Water Research Association, Marlow (England). Resources Group.
For primary bibliographic entry see Field 06A.
W72-09066
Ecole Nationale Superieure des Mines de Paris, Fontainebleau (France). Laboratoire d'-Hydrogeologie Mathematique.
For primary bibliographic entry see Field 06A.
W72-09076

4C. Effects on Water of Man's Non-Water Activities

ENVIRONMENTAL GEOMORPHOLOGY.

Proceedings of 1st Annual Geomorphology Symposia Series, held at Binghamton, N.Y., Oct 16-17, 1970, D. R. Coates, editor,: State University of New York at Binghamton, Publications in Geomorphology, August 1971. 262 p.

Descriptors: *Geomorphology, *Environmental effects, Water resources development, *Highway effects, *Urbanization, Floods, Erosion, Sedimentation, Social aspects, Beach erosion, Hydrogeology.
Identifiers: *Environmental geomorphology.

This seminar is a sampling of the type of work now being done in environmental geomorphology. Environmental geomorphology is the practical use of geomorphology for the solution of problems where man wishes to transform landforms or to use and change surficial processes. Its study, interpretation, and planning include land-fill operations, groundwater mining and subsidence, streamflow regime upsets, and hillslope modifications. In addition, environmental geomorphology includes extraction of surficial materials, and protection of landscapes which benefit man. The goal for geomorphic environmental studies is to minimize topographic distortions and to understand the interrelated processes necessary in restoration, or maintenance, of the natural balance. The objectives of this symposium are to demonstrate that geomorphology can play an important part in providing solutions for some environmental problems, illustrate the current status of environmental geomorphology in some areas, and provide some educational guidelines. (See W72-08511 thru W72-08516) (Knapp-USGS)
W72-08510

STREAM REGIMEN AND MAN'S MANIPULATION,
Indiana Univ., Bloomington. Dept. of Geology.
For primary bibliographic entry see Field 04A.
W72-08511

DEBRIS AVALANCHES-A GEOMORPHIC HAZARD,
Geological Survey, Arlington, Va.
For primary bibliographic entry see Field 02J.
W72-08512

LAND SURFACE FORM IN FLOOD HYDROLOGY,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.

For primary bibliographic entry see Field 02E.
W72-08513

FORMS AND CYCLES IN BEACH EROSION AND DEPOSITION,
Columbia Univ., New York. Teachers Coll.
For primary bibliographic entry see Field 02J.
W72-08514

NATURAL AND MAN-INDUCED DISTURBANCES OF PERMAFROST TERRANE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02C.
W72-08515

IMPACT OF HIGHWAYS ON THE HYDROGEOLOGIC ENVIRONMENT,
Pennsylvania State Univ., University Park. Coll. of Earth and Mineral Sciences.
R. R. Parizek.
In: Environmental Geomorphology, Proceedings of 1st Annual Geomorphology Symposia Series, held at Binghamton, N Y, Oct 16-17, 1970: State University of New York at Binghamton, Publications in Geomorphology, p 151-199, August 1971. 9 fig, 7 tab, 61 ref.

Descriptors: *Highway effects, *Highways, *Hydrogeology, *Environmental effects, *Sedimentation, *Water pollution sources, Storm runoff, Roads, Water pollution effects, Deicers, Salts.
Identifiers: Environmental damage.

Highways may have favorable or unfavorable influences on our environment. The presence or absence of deep cuts and extensive fills can produce a large variety of transformations on the terrain and in the hydrogeologic environment. Such possible changes include beheading of aquifers, development of extensive groundwater drains, damage and pollution of water supplies, changes in groundwater and surface-water divides and basin areas, reduction of induced streambed infiltration rates, siltation of channels, obstruction of groundwater flow, and changes in runoff and recharge. Changes occur by economic activity stimulated by the highway. Sanitary, industrial, and solid wastes may be disposed of in an unsatisfactory manner. Pollution may result from maintenance procedures used to control weeds, insects, snow and ice, and from exposed stock piles of chemicals used for these purposes. (See also W72-08510) (Knapp-USGS)
W72-08516

AIRPORT IN THE LAKE,
For primary bibliographic entry see Field 06G.
W72-08541

ANOTHER VIEW OF THE LAKE AIRPORT,
For primary bibliographic entry see Field 06G.
W72-08542

EFFECTS OF ROAD SALT ON A VERMONT STREAM,
Forest Service (USDA), Milwaukee, Wis. Eastern Region.
For primary bibliographic entry see Field 05B.
W72-08808

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: EKALAKA, MONT.
Agricultural Research Service, Sidney, Mont. Northern Plains Soil and Water Research Center.
For primary bibliographic entry see Field 02B.
W72-08910

(FLORIDA ATTORNEY GENERAL'S OPINION ON ANNEXATION OF TERRITORY BEYOND A RIVER),
Florida State Dept. of Legal Affairs, Tallahassee.
For primary bibliographic entry see Field 06E.
W72-09049

4D. Watershed Protection

SOME RESULTS OF INVESTIGATIONS ON EROSION CONTROL IN WINTER WHEAT STANDS (IN RUSSIAN),
For primary bibliographic entry see Field 03F.
W72-08576

TEKAMAH-MUD CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C. Watershed Planning Div.

Available from the National Technical Information Service as PB-199 326-F, $3.00 in paper copy, $0.95 in microfiche. December 26, 1971. 36 p, 1 map, 2 tab.

Descriptors: *Environmental effects, *Nebraska, *Flood control, *Erosion control, *Multiple purpose reservoirs, *Reservoir construction, Detention reservoirs, Watersheds (Basins), Watershed management, Gully erosion, Soil erosion, Flood damage, Land management, Sedimentation, Community development, Employment opportunities, Project planning, Regional economics, Economic impact.
Identifiers: *Burt County (Neb.), *Tekamah-Mud Creek watershed (Neb), *Environmental impact statements.

Intensive land use and lack of conservation practices have resulted in frequent flooding and an accelerated erosion cycle in Burt County, Nebraska. This project is to be carried out by local sponsoring organizations with federal assistance. It consists of one multiple-purpose reservoir with storage capacity for recreation, floodwater, and sediment; four combination floodwater retarding-grade stabilization structures; and ten grade stabilization structures. Favorable environmental effects of the project include reduction of erosion and land destruction; reduction in floodwater and sediment damage to roads, bridges, farmland, and business properties; providing land for wildlife and recreational purposes; reductions in underemployment and unemployment; and improvements in maintenance of existing property and development of new properties resulting in increased tax base. Unavoidable adverse effects include the elimination of 295 acres of cropland and woodland due to sediment and recreation pools; inundation of about 8 miles of flowing streams; and increased auto traffic from fishing and other recreational activities. Various alternatives to the project were studied and rejected due to increased cost and/or delay in implementation. A draft statement was sent to interested federal, local, and state agencies, and their comments are included. (Blank-Florida)
W72-08632

VIRGINIA BEACH, VIRGINIA--BEACH EROSION CONTROL AND HURRICANE PROTECTION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 08A.
W72-08634

CORNUDAS, NORTH AND CULP DRAWS WATERSHED, TEXAS, AND NEW MEXICO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-204 573-D, $3.00 in paper copy, $0.95 in microfiche. April 1971. 11 p, 1 map.

Descriptors: *Environmental effects, *Flood control, *Irrigated land, *Watershed management, Watersheds (Basins), Irrigation, Irrigation programs, Project purposes, Project benefits, Flood damage, Flood protection, Flood plains, Aquifers, Water management (Applied), Land use, Injection wells, Flood routing, Groundwater, Erosion control, Agriculture, Water quality, Water supply, *Texas, *New Mexico.
Identifiers: *Environmental impact statements.

The project consists of land treatment measures and three floodwater retarding structures. Floods in the area cause serious damage to irrigated farm land and to a nearby town. The project would provide flood protection and, through use of an injection well, recharge of a limestone aquifer which is the area's source of irrigation water. Floodwater which is disposed of into the aquifer will have a low sediment content and good quality. Land treatment measures will reduce erosion and provide a permanent water supply, especially benefiting wildlife. Construction of the project will require the use of approximately 1,315 acres of rangeland. Alteration in land use is the only adverse effect. Favorable effects include reducing erosion, sedimentation, flood damages, and groundwater salinity and aiding irrigation. The only structural alternatives would be a system of floodwater retarding structures requiring a larger commitment of resources and money. The area's dependence on irrigation agriculture precludes any change of the flood plain to a less intensive use. (Brackins-Florida)
W72-08636

RED LICK CREEK WATERSHED, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-204 255-F, $3.00 in paper copy, $0.95 in microfiche. November 15, 1971. 15 p, 2 map.

Descriptors: *Environmental effects, *Flood control, *Watersheds (Basins), Flood plains, Floodwater, Floods, Flood damage, Economic impact, Dam construction, Structural engineering, Wildlife, Fish, Water supply, Waterfowl, Land use, Sediments, Erosion, Dams, Structures, *Kentucky, Flood protection, Social aspects.
Identifiers: *Environmental impact statements, *Red Lick Creek watershed (Ky).

The flood prevention project includes four floodwater retarding structures and one multiple purpose structure. The project will utilize 244 acres for sediment pools and interrupt agricultural, forestry, and terrestrial wildlife areas on 240 acres in the flood pool area. The affected area is mainly forest and grassland. There will be benefits from reduction in floodwater, sedimentation, and erosion. The project will also permit more efficient use of flood plains, provide an additional municipal water supply, increase waterfowl and fish in the area, and provide economic benefits. In addition to the removal of 484 acres from existing uses, six miles of stream channels will be inundated. Ten families also will be relocated. There are anticipated problems associated with increased economic activity and population growth. The proposed plans and sites were selected over other alternatives on the basis of cost, feasibility, level of protection, and physical characteristics. The no action alternative would allow flood damage to continue and deprive the area of economic benefits expected from the project. The proposed action will be compatible with long-term land use. Agency comments are included. (Ilkson-Florida)
W72-08637

MATAGORDA SHIP CHANNEL, TEXAS--MAINTENANCE DREDGING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 04A.
W72-08638

STARKWEATHER WATERSHED, NORTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-202 150-F, $3.00 in paper copy, $0.95 in microfiche. August 1971. 8 p.

Descriptors: *Environmental effects, *Agricultural watersheds, *Channel improvement, *Flood control, Project planning, Water levels, Watershed management, Water conservation, Wildlife management, Conservation, Soil conservation, Water resources development, Flood protection, Sediment control, Channels, *North Dakota.
Identifiers: *Environmental impact statements, *Starkweather watershed (ND).

The project will be located in Ramsey and Cavalier Counties, North Dakota and will provide watershed conservation land treatment, supplemented by 60.6 miles of channel improvement for flood prevention and agricultural water management. The project will: reduce erosion and sediment production, reduce flooding on 66,700 acres of existing floodlands, provide lake level control for Dry Lake waterfowl habitat management, and provide mosquito control on 73,000 acres. Adverse environmental effects include: potential loss of 25% of the existing Type 3, 4, and 5 wetlands; reduction in groundwater recharge; reduction in aesthetic beauty near the channels; and alteration of existing wildlife systems near channel construction areas. Alternatives include conservation land treatment only, single purpose approach to the flood problem financed by local funds, and less intensive use of the 73,000 acres subject to floods. Project benefits include long-term increased crop production through flood control. Irreversible commitments of resources are limited to the 1,500 acres of grasslands and wetlands required for channel improvement. Comments of interested agencies are included. (Horwitz-Florida)
W72-08640

A BILL TO AUTHORIZE THE SECRETARY OF THE ARMY TO INVESTIGATE, PLAN, AND CONSTRUCT PROJECTS FOR THE CONTROL OF STREAMBANK EROSION.
Congress, Washington, D.C.; and House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-08654

PAPILLION CREEK AND TRIBUTARIES, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 08A.
W72-08831

HEADWATERS-YELLOW RIVER PROJECT MEASURE, GWINNETT COUNTY RESOURCE CONSERVATION AND DEVELOPMENT PROJECT, GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Lawrenceville, Ga.

Available from the National Technical Information Service as PB-201 331-F, $3.00 in paper copy, $0.95 in microfiche. April 1971. 18 p.

Descriptors: *Flood control, *Channel improvement, *Erosion control, *Environmental effects, Project planning, Dams, Drainage systems, Flood protection, Multiple-purpose projects, Spillways, Channels, Dam construction, Project purposes, *Georgia.
Identifiers: *Environmental Impact statements, *Yellow River (Ga.).

The project, located in Gwinnett County, Georgia, consists of: (1) a floodwater retarding structure in the form of an earth embankment with vegetative earth spillway; (2) a 30-inch spillway designed to form a sediment pool; and (3) improvement of approximately 11.3 miles of channel by removal of blockages resulting from fallen trees, rafts, and debris. Excavation will be limited to the removal of channel constrictions and the correction of actively eroding meanders. Construction of the floodwater retarding dam and channel improvements will reduce flood damages, stream bank erosion, and sedimentation of streams and the flood plain and provide a 32-acre sediment pool with limited value for fish and waterfowl. There will be a loss of wildlife habitat and timber production on sediment pool, dam, and spillway areas. Alternatives considered included land treatment and no development. The project will enhance long term productivity. Irreversible commitments of resources include 128 acres of woodland and wildlife habitat inundated for use as sediment pools. Comments of other agencies are included. (Horwitz-Florida)
W72-08846

CLIFTY CREEK LAKE, CLIFTY CREEK, WABASH RIVER BASIN, INDIANA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 08D.
W72-08852

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES.
Agricultural Research Service, Washington, D.C. Soil and Water Research Div.
For primary bibliographic entry see Field 02B.
W72-08903

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: WALNUT GULCH, ARIZ.,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02B.
W72-08904

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: VERO BEACH, FLA.,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
For primary bibliographic entry see Field 02B.
W72-08905

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: TIFTON, GA.,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
For primary bibliographic entry see Field 02B.
W72-08906

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: REYNOLDS CREEK, IDAHO,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 02B.
W72-08907

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: TREYNOR, IOWA,
Agricultural Research Service, Council Bluffs, Mo.
For primary bibliographic entry see Field 02B.
W72-08908

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: OXFORD, MISS.,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 02B.
W72-08909

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: ALAMOGORDO CREEK, N. MEX.,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02B.
W72-08911

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: COSHOCTON, OHIO,
North Appalachian Experimental Watershed, Coshocton, Ohio.
For primary bibliographic entry see Field 02B.
W72-08912

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: CHICKASHA, OKLA.,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 02B.
W72-08913

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: KLINGERSTOWN, PA.,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 02B.
W72-08914

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: COTTONWOOD, S. DAK.,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 02B.
W72-08915

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: NEWELL, S. DAK.,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 02B.
W72-08916

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: RIESEL, TEX.,
Agricultural Research Service, Riesel, Tex. Blacklands Experimental Watershed.
For primary bibliographic entry see Field 02B.
W72-08917

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: SONORA (SUTTON COUNTY), TEX.,
Agricultural Research Service, Riesel, Tex. Blacklands Experimental Watershed.
For primary bibliographic entry see Field 02B.
W72-08918

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: DANVILLE, VERMONT,
Agricultural Research Service, Danville, Vt. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02B.
W72-08919

AN INTERPRETATION OF RESERVOIR SEDIMENTATION: 1. EFFECT OF WATERSHED CHARACTERISTICS,
Purdue Univ., Lafayette, Ind. Agriculture Experiment Station.
For primary bibliographic entry see Field 02J.
W72-08948

MUDFLOWS, (SELI),
For primary bibliographic entry see Field 02J.
W72-09011

ROLE OF TECTONIC AND CLIMATIC FACTORS IN DEVELOPMENT OF TERRACES OF THE DNESTR VALLEY,
For primary bibliographic entry see Field 02J.
W72-09014

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

BIBLIOGRAPHIES IN NUCLEAR SCIENCE AND TECHNOLOGY. SECTION 14. ACTIVATION ANALYSIS,
Zentralstelle fuer Atomkernenergie-Dokumentation, Frankfurt on Main (West Germany).
W. Bock-Werthmann, and B. Sansoni.
Available from the National Technical Information Service as AEO-C-14-5, $3.00 in paper copy, $0.95 in microfiche. May 1971. 276 p.

Descriptors: *Bibliographies, *Neutron activation analysis, *Foreign research, Documentation, Conferences, Patents, Trade associations, Analytical techniques.

The volume covers 1965 with 701 entries. Author, element, and type-of-material indexes are provided. The division headings are reports, conferences, journals, books, dissertations, patents, and trade journals. (Bopp-ORNL)
W72-08543

AN EVALUATION OF THE FACTORS INVOLVED IN BIO-ACCUMULATION OF GAMMA-EMITTING RADIONUCLIDES IN WHITE--TAILED DEER (ODOCOILEUS VIRGINIANUS) - 2/1/71 TO 1/31/72,
Georgia Univ., Athens. School of Forest Resources.
J. N. Jenkins, and J. R. Monroe.
Available from the National Technical Information Service as SRO-642-1, $3.00 in paper copy, $0.95 in microfiche. Third Technical Progress Report, November 1, 1971. 38 p. AEC AT- (38-1)-642.

Descriptors: *Monitoring, *Control, *Data collections, *Regulation, *Measurement, *Cesium, *Strontium, Forage mixtures, Evaluation, Analytical techniques, Biological treatment, Bioassay, Deer, Southeast U.S., Georgia, South Carolina, Gamma rays, Radiation, Food chains, Population, Fallout, Radioecology.
Identifiers: Concentration, Bioaccumulation, Population Exposure.

Muscle samples from 267 white-tailed deer were analyzed for gamma emitting radionuclides for the period of October 70-September 71. The only gamma emitter detected of public health concern was 137 Cs. As previously reported the Lower Coastal Plain yielded samples significantly higher than the other physiographic regions of the Southeast with late fall and winter months being the peak season. Lower Coastal Plain deer last winter in Georgia averaged about 27,000 pCi/Kg. in radiocesium with one sample reaching a high of over 100,000 pCi/Kg. Specimens from the Upper Coastal Plain and the Piedmont averaged 5,842 pCI/Kg and 726 pCi/Kg. These values are slightly lower than in the previous year; however, individual counts ranged much higher indicating a unique transport system of 137 Cs from soil and vegetation into wildlife species. Strontium-90 data closely parallels that of 137 Cs in relation to areas of high bio-accumulation. (Houser-ORNL)
W72-08546

ENVIRONMENTAL RADIOACTIVITY IN GREENLAND IN 1970,
Danish Atomic Energy Commission, Roskilde. Health Physics Dept.
A. Aarkrog, and J. Lippert.
Available from the National Technical Information Service as RISO-247, $3.00 in paper copy, $0.95 in microfiche. July 1971. 18 p.

Descriptors: *Radioactivity, *Fallout, *Measurement, *Sampling, *Data collections, *Strontium, *Cesium, Environment, Precipitation (Atmospheric), Surface waters, Water pollution, Water pollution sources, Sea water, Rivers, Food chains, Human population, Animal populations, Water, Consumptive use.
Identifiers: Greenland, Concentration.

Measurements of fall-out radioactivity in Greenland in 1970 are reported. Sr-90 (and Cs-137 in most instances) was determined in samples of precipitation, sea water, vegetation, animals, and drinking water. Estimates of the mean contents of Sr-90 and Cs-137 in the human diet in Greenland in 1970 are given. The mean diet figures were in accordance with previous estimates. (Houser-ORNL)
W72-08547

ACTIVATION ANALYSIS AS A METHOD FOR TRACING SUSPENDED SEDIMENTS,
Puerto Rico Nuclear Center, Mayaguez.
For primary bibliographic entry see Field 05B.
W72-08549

TRACE METAL ASSOCIATIONS IN SUB-ARCTIC AND ARCTIC MARINE ENVIRONMENTS. WORK IN PROGRESS,
Alaska Univ., College. Inst. of Marine Science.
D. C. Burrell.
Available from the National Technical Information Service as RLO-2229-T-1-5, $3.00 in paper copy, $0.95 in microfiche. June 1971. 158 p.

Descriptors: *Analytical techniques, *Sea water, *Geochemistry, Gas chromatography, Solvent extractions, Spectrophotometry, Subarctic, Arctic Ocean, Heavy metals, Trace elements, Water analysis.

Ongoing research projects are summarized; including the topics geochemistry of subarctic fiords and the Arctic Ocean, and marine analysis. Under the latter heading are: analysis of trace metals in sea water by gas-liquid chromatography, solvent extraction of transition metals from sea water, determination of Ag in sea water by (boat-sampling) atomic absorption, and flameless atomic analysis procedures. (Bopp-ORNL)
W72-08550

TRACE ELEMENTS IN NATURAL WATERS, ANNUAL PROGRESS REPORT, DECEMBER 1, 1970 - NOVEMBER 30, 1971,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
K. K. Turekian.
Available from the National Technical Information Service as YALE-2912-34, $3.00 in paper copy, $0.95 in microfiche. August 31, 1971. 61 p.

Descriptors: *Analytical techniques, *Sea water, *Neutron activation analysis, Sediments, Sampling, Water analysis, Trace elements, Heavy metals, Atlantic Ocean, Pacific Ocean, Spectrophotometry, Mollusks, Vertical migration.

Conclusions from this research are: (1) Neutron activation analysis is more useful for sediments than for seawater since trace element concentration is higher and interference from P and S is lower. (2) Contamination of seawater during pelletizing in a freeze-drying process hampered neutron activation analysis. (3) The alternative method of analysis by flameless atomic absorption spectrophotometry does not appear to be warranted. (4) The range to be expected for Ba and Sr was shown by depth-invariant profiles in the Atlantic, contrasting with the relatively strong gradient in the North Pacific. (5) Analysis of living pteropods revealed the role played by scavenging of trace elements from sea water iron oxide. (Bopp-ORNL)
W72-08551

A SIMPLE APPARATUS FOR DELIVERING A HEAT SHOCK TO MICROSCOPIC AQUATIC ORGANISMS,
Virginia Polytechnic Inst., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W72-08578

HISTOCHEMICAL AND CYTOPHOTOMETRIC ASSAY OF ACID STRESS IN FRESHWATER FISH,
Pennsylvania State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W72-08581

AQUATIC PLANTS FROM MINNESOTA, PART 3 - ANTIMICROBIAL EFFECTS,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 05C.
W72-08586

FEASIBILITY STUDY OF WATER RESOURCE POLLUTANT IDENTIFICATION BY DIGITAL COMPUTER IDENTIFICATION OF REMOTE INFRARED SENSOR SPECTRAL SIGNATURES,
Clemson Univ., S. C. Dept. of Electrical and Computer Engineering.
B. E. Gilliland.
South Carolina Water Resources Research Institute Report No. 22, 1972. 55 p, 19 fig, 1 tab, 61 ref. OWRR S-016-SC (2).

Descriptors: *Remote sensing, *Instrumentation, *Digital computers, *Infrared radiation, *Pollutant identification, Water pollution sources, Domestic wastes, Industrial wastes, *Waste identification, Data collections, Data processing, Mathematical models, Computer models, *South Carolina.
Identifiers: *Lake Hartwell (SC).

Solid-state multispectral sensor systems are shown to offer the promise of remote measurement of water quality parameters, and with proper auxiliary information, the identification of pollutants. The sensor system is an optically filtered, semi-conductor detector based system which views the surveyed scene radiation at 10 points between 0.4 micro m and 3.5 micro m. Spectral reflectance data from a variety of industrial and municipal pollutant sources are shown to exhibit unique spectral characteristics. Each pollutant has its own spectral signature or 'fingerprint.' These signatures can permit the detection of the presence of the pollutants in water bodies. With adequate characterization of the water body spectral qualities and with ground truth information both qualitative and quantitative determinations of water pollutant parameters are potentially possible. Signal processing considerations amenable to both off-line and on-line, real-time computer processing of the multispectral data are discussed.
W72-08592

A COMPARISON OF GEIGER-MUELLER AND LIQUID SCINTILLATION COUNTING METHODS IN ESTIMATING PRIMARY PRODUCTIVITY,
Manitoba Univ., Winnipeg. Dept. of Zoology.
F. J. Ward, and Masami Nakanishi.
Limnology and Oceanography Vol 16, No 3, p 560-563. 1971.
Identifiers: Algae, Geiger, Mueller, *Primary productivity, Scintillation, *Analytical techniques, *Radioactivity techniques.

Primary productivity estimated from liquid scintillation counts of the radioactivity of wet 14C-labeled algae on membrane filters was about 30% greater than an estimate from Geiger-Mueller (G-M) counts of comparable algae and filters that had been desiccated. A subsequent estimate from recounts of the G-M filters by the scintillation procedure was 21% less than that obtained from scintillation counts of wet filters. Most of the difference between the 2 methods is probably caused by the drying procedure required in sample preparation for G-M counting. The remaining difference, about 9%, may have been caused by variability in estimates of the specific activity of 14C added to the incubation bottles (+7%) and errors associated with estimating zero-thickness activity of 14C-BaCO3 precipitates.--Copyright 1972, Biological Abstracts, Inc.
W72-08604

PROCEEDINGS OF MEETING ON ENVIRONMENTAL POLLUTION (2ND) 24-25 MARCH 1971, SPONSORED BY AMERICAN ORDNANCE ASSOCIATION.

Available from the National Technical Information Service as AD-729 929, $3.00 in paper copy, $0.95 in microfiche. Edgewood Arsenal Special Publication EASP 100-102, August 1971. 215 p, 113 fig, 13 tab.

Descriptors: *Water pollution control, *Waste disposal, *Water quality control, *Pesticides, *Industrial wastes, Instrumentation, Monitoring, Spectroscopy, Toxicity, Pesticide removal, Plastics, Bioindicators, Conferences.
Identifiers: Raman spectroscopy.

Papers were presented by representatives of the Department of Defense, Environmental Protection Agency, Edgewood Arsenal, State and Municipal agencies and industry. Topics included solid and liquid waste disposal, water and air pollution control, and air monitoring techniques. Specific titles include: 'Considerations in Remote Raman Spectroscopy', 'The Environmental Protection Agency R and D Program for Water Quality Control', 'Nuclear Power and the Environment', 'Edgewood Arsenal's Test Area Ecology Program', 'Solid Waste Disposal From the State's Point of View', 'Handling and Incineration of Pesticides, Plastics and Hazardous Chemicals'. (Holoman-Battelle)
W72-08736

ISOLATION OF ANAEROBES.

Academic Press, Inc., New York, N.Y. 1971. D.A. Shapton and R. G. Board, editors. 257 p.

Descriptors: *Isolation, *Cultures, Soil bacteria, Protozoa, Fungi, Photosynthetic bacteia, Sulfur bacteria, Nitrogen fixing bacteria, Soil microorganisms, Clostridium, Enteric bacteria, Bioassay, Animal wastes, Poultry, Ruminants, Sediments, Foods, Soils.
Identifiers: *Enumration, Enrichment, Cellulolytic bacteria, Lipolytic bacteria, Bacteriodaceae, Biological samples, Bacteroides fragilis, Sphaerophorus, Fusiformis, Zymomonas anaerobia, Fusobacteria, Spirochaetes, Microaerophilic vibrio, Anaerobes, Culture media, Feces, Tissue, Entodinium caudatum, Entodinium simplex, Epidinium ecaudatum caudatum, Polyplastron multivesiculatum, Actinomyces, Leptotrichia, Veillonella.

Methods are presented for culturing, isolating, and enumerating anaerobic microorganisms including Clostridia; enteric bacteria; anaerobic bacteria of man, ruminants, poultry, and horses; photosynthetic bacteria; nitrogen-fixing bacteria; sulfur bacteria; protozoa; and fungi. The methods are used for isolating the bacteria from animal tissue, food, feces, soil, intestines, bovine rumen, and the human mouth. (Holoman-Battelle)
W72-08737

PESTICIDES IDENTIFICATION AT THE RESIDUE LEVEL.

American Chemical Society, Washington, D.C., Advances in Chemistry Series No. 104, 1971. 182 p.

Descriptors: *Instrumentation, *Conferences, *Pesticide residues, *Analytical techniques, Chemical analysis, Bioassay, Chromatography, Spectrophotometry, Enzymes, Aldrin, Chlorinated hydrocarbon pesticides, Carbamate pesticides, DDT, Dieldrin, Endrin, Phenolic pesticides, Selectivity, Organophosphorus pesticides, Public health, Pesticides, Gas chromatography, Spectroscopy, Neutron activation analysis, Biochemistry, Halogenated pesticides, Methodology, Insecticides, Chlorine, Data collections, Computers, Diazinon, Diquat, Ionization, Heptachlor, Photometry, Herbicides, Colorimetry, Fluorometry, Manometers, Potentiometers, Volumetric analysis, Spectrometers, Lipids, Organic pesticides, Organophosphorus compounds, Paraquat, Separation techniques, Sulfur, Data processing, Heavy metals, Foods, Water analysis, Soils, Plants.
Identifiers: *Detection limits, Ultra micro analysis, Detectors, Gas-liquid chromatography, Paper chromatography, Infrared spectrophotometry, Ultraviolet spectrophotometry, Mass spectrometry, Thin layer chromatography, Immunology, Acetylchloline, Acetylthiocholine iodide, Alkali flame detectors, Aniline derivatives, Antigens, Antiserums, Azobenzenearsonates, Benthane, Benene, Benzoid chromophore.

The purpose of this symposium sponsored by the Division of Pesticide Chemistry of the American Chemical Society is to survey the present status of the classical physical, chemical, and biochemical techniques employed for residue analysis; to evaluate critically the more recently applied, relatively unexploited techniques which have become available for the detection, quantitation, and characterization of pesticide residues; and finally, to examine and discuss the current needs and problems, stimulate and encourage greater research activity, and point the way to future developments in the analysis of pesticide residues. The four general topics include: philosophical aspects of ultramicroanalysis, instrumental techniques, microchemical methods, and biological assay methods. Emphasis is placed on gas-liquid chromatographic detectors, infrared and ultraviolet spectrophotometry, paper and thin-layer chromatography, mass spectrometry, and neutron activation analysis. Recently developed techniques employing chemical and photochemical conversion of pesticides into derivatives useful for the confirmation of the parent residue at picogram and nanogram concentration levels are discussed. The utility of biological assay methods for the identification of residues is explored particularly from the point of view of enzymatic and immunological techniques. (Jefferis-Battelle)
W72-08738

CONTRIBUTIONS TO THE KNOWLEDGE OF THE FRESH WATER ALGAE OF PORTUGAL, I,
Coimbra Univ. (Portugal). Institute Botanico Dr. Julio Henriques.
For primary bibliographic entry see Field 05C.
W72-08785

METHODS, MODELS AND INSTRUMENTS FOR STUDIES OF AQUATIC POLLUTION. AN ANNOTATED BIBLIOGRAPHY,
Ocean Engineering Information Service, La Jolla, Calif.
E. Sinha.
Available from Ocean Engineering Information Service, La Jolle, Cal. 92037, Price: $6.00. Ocean Engineering Information Series Vol 5, 1971. 29 p.

Descriptors: *Bibliographies, *Analytical techniques, *Water pollution control, *Instrumentation, Mathematical models, Water analysis, Pollutant identification, Detergents, Nutrients, Pesticides, Oil, Metals, Thermal pollution, Sampling, Bacteria, Toxicity, Behavior, Bituminous materials, Animal wastes, Fish, Fluorescence, Infrared radiation, Irradiation, Spectrophotometry, Spectroscopy, Heavy metals, Lignins, Farm wastes, Polarographic analysis, Sedimentology, Sediments, Surveys, Phosphorus, Dissolved oxygen, Biochemical oxygen demand, Clams, Crustaceans, Phosphates, Anion exchange, Lakes, Rivers, Nitrogen, Great Lakes, Volumetric analysis, Entrophication, E. coli, Bioassay, Bottom sediments, Membrane processes, Digital computers, Algae, Radioactivity techniques, Separation techniques.
Identifiers: Voltammetry, Radiography, Ion selective electrodes, Lasers, Orthophosphates.

This bibliography contains 204 abstracts of literature providing substantial scientific and technical information on methods, models and instruments used in studies of aquatic pollution and means of abatement. These deal with the detection, identification and measurement of the parameters of pollution, biotic constituents, detergents and nutrients, pesticides, oil, metals, and non-metallic toxicants. Various aspects of water quality management are encompassed. Pertinent patents, a bibliography of bibliographies, a subject outline, a keyterm index, and an index citing all authors and co-authors are included. (Mortland-Battelle)
W72-08790

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 7 AND 8. LOWER MISSISSIPPI RIVER BASIN AND WESTERN GULF OF MEXICO BASINS.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-08805

ATOMIC ABSORPTION SPECTROPHOTOMETRY SIMPLIFIES HEAVY--METALS ANALYSIS,
Chicago Dept. of Water and Sewers, Ill. Water Purification Div.
B. F. Willey, C. M. Duke, A. L. Wojcieszak, and C. T. Thomas.
Journal of American Water Works Association, Vol 64, No 5, p 303-306, May 1972. 7 ref.

Descriptors: *Heavy metals, *Trace elements, *Spectrophotometry, *Instrumentation, Pollutant identification, Chemical analysis, Water analysis, Flame photometry.
Identifiers: *Atomic absorption spectrophotometry.

Atomic absorption is superior to wet chemistry for the analysis of heavy metals. The basic operating principles, procedures for adjusting the instrument settings, and precautions concerning operation are discussed. Several metals may be determined either by absorption or emission. The selection is based on the expected concentration of the metal ion being determined. Flameless atomic absorption has proved its value and effectiveness for extremely low level mercury determinations. This same methodology promises to be useful for arsenic and selenium. (Knapp-USGS)
W72-08807

ANALYSIS OF ENVIRONMENTAL SAMPLES BY SPARK SOURCE MASS SPECTROMETRY--1. TRACE ELEMENTS IN WATER,
Atomic Energy of Canada, Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
I. H. Crocker, and W. F. Merritt.
Water Research, Vol 6, No 3, p 285-295, March 1972. 2 fig, 2 tab, 14 ref.

Descriptors: *Mass spectrometry, *Water analysis, *Trace elements, Pollutant identification, Analytical techniques, Instrumentation, Sampling.

Spark-source mass spectrometry is ideally suited to the determination of trace elements in natural waters. Almost all of the elements present in lake or river waters may be routinely determined. In some analyses 30 or more elements were found in each sample. The main features of the procedure are freeze-drying for sample preconcentration, low temperature oxygen plasma ashing to eliminate organic ion interferences, sample presentation to the mass spectrometer in counter-electrodes tipped with a homogeneous conducting ash-carbon mixture, and a new method of electrical detection and measurement of the mass-resolved ion beams. Precisions achieved for individual elements in a rapid 10 min electromagnetic scan from mass number 238 down to mass number 7 averaged 30%. Using the electrostatic peak switching mode and the expenditure of considerably more time, precisions of better than 5% were possible. Accuracy is dependent upon the availability of suitable calibration standards and upon the concentration range of the particular elements determined. (Knapp-USGS)
W72-08823

GAS CHROMATOGRAPHY VERSUS INFRA-RED SPECTROMETRY FOR DETERMINATION OF MINERAL OIL DISSOLVED IN WATER,
Instituut voor Gezondheidstechnick TNO, Delft (Netherlands).
R. Jeltes, and W. A. M. den Tonkelaar.
Water Research, Vol 6, No 3, p 271-278, March 1972. 3 fig, 4 tab, 15 ref.

Descriptors: *Gas chromatography, *Pollutant identification, *Oily water, Aqueous solutions, Water analysis, Chemical analysis, Chromatography, *Organic compounds.
Identifiers: *Hydrocarbons.

Gas chromatography and infra-red spectrometry were compared for the determination of the hydrocarbon content of aqueous solutions of crude oil and six refinery products. Gas chromatography was the most suitable method to determine the hydrocarbon content of water; besides a more complete total measurement, it yields data about the individual compounds. Infra-red analysis reveals the occurrence of dissolved polar compounds originating from mineral oil. (Knapp-USGS)
W72-08824

QUANTITATIVE EVALUATION OF WATER QUALITY IN THE COASTAL ZONE BY REMOTE SENSING,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
W. P. James.
Texas A and M University Remote Sensing Center Technical Report RSC-33, September 1971. 67 p, 15 fig, 40 ref. NASA Grant NsG 239-62.

Descriptors: *Remote sensing, *Estuaries, *Water pollution, *Surveys, *Monitoring, Aerial photography, Infrared radiation, Instrumentation, Mapping, Water quality, Eutrophication, Photometry, Path of pollutants.

Remote sensing can be a valuable tool for a program used to control the quality of water in an estuary. By monitoring both the pollution sources and the environmental quality the interactions between the components of the estuarine system can be better understood. Remote sensing can provide comprehensive quantitative water quality data of a large area. Variations in light returned from the water column can be quantitatively related to water quality parameters. Thus, remote sensing can be used to detect pollution sources, map the zone of influence of the waste source and the water quality, and determine waste disposal design parameters such as diffusion coefficients and circulation patterns. Many of the subtle changes in vegetative patterns and density caused by extended exposure to low waste concentrations might be detected by a continuous monitoring program. By understanding the response of the environment to various waste loadings, the effect of additional pollution can be predicted and degradation of the water quality prevented by proper waste management decisions. (Knapp-USGS)
W72-08996

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS AND ADJOINING AREAS, APRIL 1965 - SEPTEMBER 1969,
Geological Survey, Austin, Tex.
H. L. Kunze, and J. Rawson.
Texas Water Development Board, Austin, Report 140, February 1972. 139 p, 9 fig, 53 tab, 7 ref.

Descriptors: *Water quality, *Reservoirs, *Chemical analysis, *Water analysis, *Texas, Water chemistry, Data collections, On-site investigations, Laboratory tests, Water quality control, Water temperatures, Sampling, Surveys.

A convenient compilation of water-quality records is presented for eight reservoirs in Texas that were studied during the period April 1965 through September 1969. The reservoirs are Lake Texoma, Sam Rayburn, Hubbard Creek, Possum Kingdom, Whitney, Proctor, Belton, and Red Bluff. Water-quality data for each of the sites for a particular reservoir were not collected during every survey of the reservoir. Instead, the specific conductance, dissolved-oxygen content, temperature, and pH of the water at a number of strategic sites usually were determined 1 foot below the water surface, near the reservoir bottom, and at several intermediate depths. The results of these on-site determinations were used as guides in the collection of water samples for laboratory analyses. These data are shown in 52 tables. (Woodard-USGS)
W72-09000

DETERMINATION OF TECHNETIUM BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Argonne National Lab., Idaho Falls, Idaho.
W. A. Hareland, E. R. Ebersole, and T. P. Ramachandran.
Analytical Chemistry, Vol. 44, No. 3, p 520-523, March 1972. 6 fig, 3 tab, 9 ref.

Descriptors: *Spectrophotometry, *Laboratory equipment, Absorption, Chemical analysis, *Uranium radioisotopes, Radioactivity, Heavy metals, Molybdenum.
Identifiers: *Atomic absorption spectrophotometry, Detection limits, Chemical interference, Sample preparation, *Technetium.

A technetium hollow-cathode lamp was constructed from a commercial Perkin-Elmer lamp by removing the quartz envelope and inserting a technetium-plated foil into the cathode and sealing a vacuum stopcock to the evacuation tube to allow pressure regulation. Using this lamp as a spectral line source, the atomic absorption characteristics of technetium were investigated. The sensitivity for technetium in aqueous solution is 3.0 micrograms/ml in a fuel-rich acetylene-air flame for the unresolved 2614.23-2615.87 Angstrom doublet under the optimum operating conditions. The absorption of spectral radiation was studied as a function of wavelength, fuel-to-oxidant ratio, hollow-cathode lamp current, burner height, and spectral bandwidth. Studies with 32 cations at concentrations of 50 and 500 micrograms/ml indicated that only calcium, strontium, and barium caused severe technetium absorption suppression with 60 micrograms/ml of technetium in 2 N hydrochloric acid solutions. The cationic interferences are eliminated by adding aluminum to the test solutions. (Mackan-Battelle)
W72-09089

A SIMPLE DEVICE FOR THE SORTING OF LIVING PLANKTONIC COPEPODS,
Station Zoologique, Villefranche-sur-Mer (France).
S. Nival, and P. Nival.
Limnology and Oceanography, Vol. 16, No. 6, p 977-980, November 1971. 3 fig, 1 ref.

Descriptors: *Plankton, *Microscopy, *Copepods, Analytical techniques, Laboratory equipment.
Identifiers: *Sorting, Binocular microscope, Plankton sorter, Perspex cock, Laboratory techniques.

A Perspex plankton sorter that can be set on the stage of a binocular microscope consists of a four-way casing with a one-way cock, which allows isolation of a copepod for observation and identification. The organism then may be rejected or selected by movement of the cock. The device offers the advantage of holding the copepods in a large volume of water during identification and of illuminating them for a brief time. The size of the observation chamber can be adapted to the size of the copepods being studied. No difference in respiration rates has been observed for organisms sorted in this device and those sorted by pipettes. (Mortland-Battelle)
W72-09091

KAISER REFRACTORIES ENVIRONMENTAL STUDIES,
Moss Landing Marine Labs. Calif.
For primary bibliographic entry see Field 05C.
W72-09092

GAS CHROMATOGRAPHY IN THE ANALYSIS OF INORGANIC MATERIALS (REVIEW),
Vsesoyuznyi Neftyanoi Nauchno-Issledovatelskii Geologorazvedochnyi Institut, Leningrad (USSR).
B. I. Anvaer, and Yu S. Drugov.
Zhurnal Analiticheskoi Khimii, Vol. 26, No. 6, p 1180-1197, June, 1971. 6 fig, 4 tab.

Descriptors: *Analytical techniques, *Gas chromatography, *Reviews, *Inorganic compounds, Polarity, Spectrophotometry, Flame photometry, Metals, Separation techniques, Stable isotopes, Oxides, Methane, Ammonia, Chlorine, Sulfur compounds, Fluorides, Sulfides, Carbonates, Silicates, Halides, Water, Metal, Deuterium, Oxygen isotopes, Trace elements, Nitrogen compounds, Heavy metals, Gases, Nitrogen, Aluminum, Argon, Boron, Bromine, Hydrogen, Helium, Iron, Gold, Iodine, Cadmium, Oxygen, Cobalt, Nickel, Mercury, Lead, Sulfur, Strontium, Titanium, Carbon, Phosphorus, Fluorine, Chlorine, Magnesium, Manganese, Copper, Molybdenum, Sodium, Chromium, Cesium, Zinc, Carbon dioxide, Hydrogen sulfide.

This review covers published work from 1903 to 1970 related to the gas chromatographic analysis of inorganic materials. The review indicates that at least 60 elements have already been analyzed by gas chromatography and that several others could be. In this review, materials are grouped according to boiling ranges: low boiling gases; aggressive gases and liquids boiling over an average temperature range; and metals and their compounds, which generally boil at high temperatures. The various gas chromatographic techniques that have been used to analyze materials in each of these groups are discussed. The review is based on 300 literature references. (Mortland-Battelle)
W72-09096

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, LOUISIANA: PHASE I, AREA DESCRIPTION AND PHASE IV, BIOLOGY,
Louisiana Wild Life and Fisheries Commission, New Orleans.
For primary bibliographic entry see Field 02L.
W72-09097

THE FEASIBILITY OF ADP OF AIRBORNE LINE SCAN IMAGERY FOR NEAR SHORE BATHYMETRY,
Development and Resources Transportation Co., Silver Spring, Md.
For primary bibliographic entry see Field 07C.
W72-09098

CARBON DIOXIDE IN THE SURFACE WATERS OF THE BARENTS SEA: SOUTHWIND EXPEDITION - 1970,
Alaska Univ., College. Inst. of Marine Science.
J. J. Kelley, and D. W. Hood.
Available from the National Technical Information Service as AD-734 673, $3.00 in paper copy, $0.95 in microfiche. Report No. R71-20, September 1971. 16 p, 3 fig, 1 tab, 8 ref. ONR Contract N00014-67-A-0317-001AD.

Descriptors: *Carbon dioxide, *Sea water, *Surface waters, *Analytical techniques, Currents (Water), Phytoplankton, Equilibrium, Arctic, Sea ice, Sampling, Pumps, Arctic Ocean, Supersaturation, Water analysis, Air.
Identifiers: *Barents Sea, Infrared gas analyzer, Chlorophyll a, Webtrol pump, Bering Sea, On board analysis.

The equilibrium concentration of CO2 with respect to air in the surface waters of the Barents Sea was measured during late summer 1970 aboard the U. S. Coast Guard Icebreaker SOUTHWIND to gain information on the magnitude of CO2 partial pressures in the region of the Arctic summer sea ice pack. Observations were made from 37 oceanographic stations, most of which were located in or close to the arctic ice pack. Air was monitored for CO2 by a nondispersive infrared gas analyzer. In all cases the surface seawater was undersaturated in CO2 with respect to air as verified by previous studies. Investigators studying the Bering Sea and Arctic Ocean during the winter observed a supersaturation of CO2 in surface seawater. Summer conditions of CO2 undersaturation are thought to reflect the effect of biological utilization of CO2 by autotrophic plants. (Mortland-Battelle)
W72-09099

ESTIMATION OF THE BIOMASS OF PLANKTON,
Municipal Waterworks of Amsterdam (Netherlands).
G. P. H. van Heusden.
Hydrobiologia, Vol. 39, No. 2, p 165-208, February 29, 1972. 21 fig, 15 tab, 20 ref.

Descriptors: *Biomass, *Mathematical studies, *Plankton, *Estimating, Numerical analysis, Equipment, Aquatic populations, Equations, Sampling, Sieves, Distribution patterns, Zooplankton, Microscopy, Phytoplankton, Instrumentation, Filtration, Measurement, Methodology, Spatial distribution, Seasonal, Probability, Population.
Identifiers: *Biocenosis, Counting chambers, Counting, Poisson distribution, Data interpretation.

The various mathematical relations found in a plantonic biocenosis and its seasonal and spatial distribution and a new technique for sampling and counting plankton for biomass estimation are presented. The logarithms of numbers of individuals of the various species in a biocenosis form a normal probability curve. A similar relation is found in the volumes of individuals of the various species and also in the biomass of the various populations. The relationship between the various biomasses is the mathematical product of number and mean volume. An approximative hyperbolic function can be derived from the population volumes and with the aid of a simple equation the plankton biomass is calculated. Only ten or twenty of the most dominant populations have to be counted and measured. The biomasses of the populations in various plankton samples may be compared using hyperbolic or probability relationships and the biomasses of plankton in various habitats may be compared in a graphic way. The number of organisms of each species to be counted depends on the degree of accuracy and has to be about a hundred. Sampling at ten places and working with the mean of the ten samples are compulsory. For gregarious zooplankters a reliable mean may be calculated using the hyperbolic function which seems to describe their densities at various places. The rotary, electric pump method was chosen for collecting plankton. A translucent hose with a special and moving mouth is let down into the water. Water passes through the plankton net, pump, and water meter, respectively, drawing a series of 7 samples of increasing decimal volumes. The plankton is concentrated and fractionated by means of two sedimentation chambers and four small plankton sieves and three plankton nets of various standardized meshes. The square counting chambers of 10 sq cm were used and the organisms enumerated by means of an inverted microscope which projects the image on a ground glass. Only organisms seen within a measured square on the glass are counted. By standardizing sample volumes, microscope magnifications, and the dimensions of the squares, the conversion factors are so simple that only zeros or a decimal point have to be placed in the number counted to obtain an estimation of the biomass. (Mackan-Battelle)
W72-09100

COMPUTER PROGRAMS FOR USE IN X-RAY SPECTROGRAPHY-DETERMINATION OF TRACE ELEMENTS AND OF DEAD-TIME OF COUNTERS,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
A. C. Oertel.
Available from the National Technical Information Service as PB-204 592, $3.00 in paper copy, $0.95 in microfiche. Division of Soils Technical Paper No. 5, 1971. 17 p.

Descriptors: *X-ray spectroscopy, *Trace elements, *Computer programs, Silica, Fluorescence, Silicates.
Identifiers: Counting, Dead-time, X-ray counters, Zirconium, Chemical interference.

Three computer programs for use in x-ray spectroscopy are described. Two are for determination of trace elements. The first, in Fortran, is applicable where the analysis line is subject to interference and has been used for determining zirconium in silicate samples. The second, also in Fortran, is used where both the analysis line and adjacent background are subject to interference and is a more general version of the first program. The third program, written in Algol and Fortran, is for determining dead-times of x-ray counters. This report includes details on the data deck for these programs. (Mortland-Battelle)
W72-09101

THE PHYSIOLOGICAL STATE WITH RESPECT TO NITROGEN OF PHYTOPLANKTON FROM LOW-NUTRIENT SUBTROPICAL WATER AS MEASURED BY THE EFFECT OF AMMONIUM ION ON DARK CARBON DIOXIDE FIXATION,
Nova Univ., Dania, Fla. Physical Oceanographic Lab.
For primary bibliographic entry see Field 05C.
W72-09103

GAS-CHROMATOGRAPHIC SEPARATION OF HYDROGEN SULFIDE, AIR, AND WATER,
Lakehead Univ. Thunder Bay (Ontario). Dept. of Chemistry.
W. G. Cook, and R. A. Ross.
Analytical Chemistry, Vol. 44, No. 3, p 641-642, March 1972. 4 fig, 8 ref.

Descriptors: *Gas chromatography, *Separation techniques, Hydrogen sulfide, Gases, Carbon dioxide, Water, Air, Pulp and paper industry, Chemical wastes, Industrial wastes, Water analysis.
Identifiers: Chromatography columns, Chromatography peaks, Carbowax.

The resolution of small amounts of hydrogen sulfide from large quantities of air and water was accomplished with a Porapak Q column linked to a Carbowax column to increase the resolution. The total column length was 12 ft, 6 ft of Porapak Q (mesh 80/100) treated with 1/4 percent Triton 305 joined to 6 ft of 5 percent Carbowax 1500 on Teflon 6 (mesh 40/60). The o. d. of the stainless steel column was 1/8 in. and the carrier gas was helium, flowing at 60 ml/min. An aqueous 7.5 microliter sample and a 1 ml vapor phase sample gave good separations of carbon dioxide, hydrogen sulfide, and water using a hot wire detector. The minimum quantity of hydrogen sulfide producing a recorder response was 0.77 micrograms using an experimental dilution technique. With a 10 ml sample loop, this corresponded to a minimum detectable concentration of about 50 ppm v/v. Advantages are: rapid analysis time and definite separation of components without using either temperature programming or cold traps. The columns have been used in a Beckman GC-M gas chromatograph to analyze gas samples which were either synthetic or directly extracted from the main stack in a Kraft pulp mill chemical recovery plant. (Mackan-Battelle)
W72-09105

ALTERNATING CURRENT AND DIRECT CURRENT POLAROGRAPHY IN CONCENTRATED HYDROFLUORIC ACID SOLUTIONS WITH A TEFLON DROPPING MERCURY ELECTRODE,
Melbourne Univ., Parkville (Australia). Dept. of Inorganic Chemistry.
A. M. Bond, and T. A. O'Donnell.
Analytical Chemistry, Vol. 44, No. 3, p 590-592, March 1972. 2 fig, 10 ref.

Descriptors: *Polarographic analysis, *Electrodes, *Electrochemistry, Reduction, Chemical analysis, Cadmium, Lead, Tin, Electrolytes, Solvents, Thallium, Nitrates, Alternating currents, Direct currents, Electric currents, Acids, Chemical reactions, Analytical techniques, Metals, Heavy metals.
Identifiers: Stannous fluoride, *Hydrofluoric acid, Detection limits, Teflon, *Dropping mercury electrode, Ion selective electrodes.

A teflon drop mercury electrode (DME), consisting of a teflon portion with a 250 micron orifice and a glass capillary portion was constructed with slight modification according to Raaen and used in separate ac and dc polarography of 50 percent hydrofluoric acid solutions with additions of cadmium (II), lead (II), and thallium (I) as their nitrates, and tin (II) as stannous fluoride. All potentials were recorded relative to a Ag/AgCl (1M NaCl) reference electrode. All polarograms were obtained with a Metrohm Polarecord E261 at 20 C plus or minus 2 C. An applied ac voltage of 10 mV rms, at 5 H2 was used to obtain all ac polarograms. On two hundred consecutive drops, no variation of any current drop time curve was greater than plus or minus 0.5 percent. The polarigraphically usable potential range in 50 percent Hf was about 0.4 to - 0.95 volt versus Ag/AgCl. The limit in the positive region was oxidation of mercury, and in the negative region, hydrogen evolution. Detection limits of ac polarography were: for cadmium (II), .000001 M; lead (II), .000005 M; tin (II), .000001 M (cathodic wave), .00001 M (anodic wave); thallium (I), .000005 to .0001 M. Plots of ac

wave height vs. concentration of the metals were linear to approximately their detection limit concentrations. This work further showed that electrode reactions of the metals were reversible and as such could be maintained in concentrated hydrofluoric acid. (Mackan-Battelle)
W72-09106

STANDARD POTENTIAL OF THE COPPER (II)-(I) COUPLE IN ACETONITRILE,
Alberta Univ., Edmonton. Dept. of Chemistry.
J. K. Senne, and B. Kratochvil.
Analytical Chemistry, Vol. 44, No. 3, p 585-588, March 1972. 1 fig, 6 tab, 17 ref.

Descriptors: *Oxidation-reduction potential, *Electrochemistry, *Copper, Potentiometers, Mathematical studies, Electrodes, Oxidation, Chemical reactions, Metals, Monitoring, Equations, Silver, Equipment, Instrumentation.
Identifiers: *Acetonitrile, *Copper (II)- (I) couple, Nitrosyl perchlorate, Tetrakis acetonitrile copper (II) perchlorate, Tetraethylammonium perchlorate, Henderson equation, Potential drift, Ethylacetate, Ion selective electrodes.

A potentiometric measurement was achieved for the Copper (II)- (I) couple in acetonitrile by using a cell in which liquid junction potentials were eliminated by an extrapolation procedure. Two cell arrangements were used: with solution additions and with cell assembly being performed in a dry box (which decreases the potential of the couple). Immediately following assembly, each cell was thermostated at 25.0 plus or minus 0.02 C and the potential monitored for 6-10 hours, after which a linear extrapolation of potential to time zero was made. Total potential drift was on the order of 1-2 mV. A value of 0.679 plus or minus 0.001 V versus the standard silver electrode in acetonitrile was obtained. These results support the assumption of complete dissociation of copper (II) perchlorate in acetonitrile. Comparison of the results with cells with junction indicate that under the conditions used, the Henderson equation gives only a rough approximation of junction potentials. (Mackan-Battelle)
W72-09107

THE SEASONAL VARIATION OF DISSOLVED ORGANIC CARBON IN THE INSHORE WATERS OF THE MENAI STRAIT IN RELATION TO PRIMARY PRODUCTION,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
A. W. Morris, and P. Foster.
Limnology and Oceanography, Vol. 16, No. 6, p 987-989, November 1971. 1 fig, 6 ref.

Descriptors: *Analytical techniques, *Organic compounds, *Carbon, Gravimetric analysis, Productivity, Seasonal, Chlorophyll, Algae, Phytoplankton, Water analysis, Carbon cycle, Organic matter, Nutrients.
Identifiers: *Dissolved organic carbon, *Menai Strait (Wales).

A regular annual cycle for dissolved organic carbon was found in the Menai Strait from measurements made over a two-year period. Ultraviolet photooxidation of 1-liter samples of water followed by gravimetric estimation of the liberated carbon dioxide was used for determinations. Winter levels of about one mg C/liter are followed by a steady increase through spring and summer, reaching maximum values of 3-4 mg C/liter in autumn followed by a sharp return to winter values. Studies indicated a high rate of production is maintained throughout the summer period although the standing crop may vary considerably. (Snyder-Battelle)
W72-09108

RAPID TESTS FOR PATHOGENS IN WATER SUPPLIES.
Susquehanna Corp., Alexandria, Va. Atlantic Research Div.

Available from the National Technical Information Service as AD-734 341, $3.00 in paper copy, $0.95 in microfiche. Report No. LWL-CR-04B69, September 1971. 93 p, 27 fig, 14 tab. Contract No. DAAD05-71-C-0177.

Descriptors: *Water analysis, *Bacteriophage, *Enteric bacteria, Pathogenic bacteria, E. coli, Samonella, Shigella, Sewage, Regression analysis, Statistical methods, *On-site tests, On-site investigations, Assay.
Identifiers: Counting, Plaque counts, Salmonella typhimurium, Shigella flexneri, Quantitative estimations, Reverse phage titer rise, LWL rapid bacterial test kit, Detection limits.

A portable field test kit (LWL Rapid Bacterial Test Kit) has been designed which is capable of assaying 10 water samples for the presence of the phages which lyse E. coli, Salmonella typhimurium, and Shigella flexneri. With this kit a water assay may be completed within 6-8 hours by application of the reverse Phage Titer Rise reaction. As few as 1-2 phage particles in a 50 ml sample may be detected. The Rapid Bacterial Test Kit is described in detail and instructions are given for its use. Experimental data are provided which illustrate the quantitative relationship between coliforms and coliphage in natural waters. A procedure is given for the quantitative estimation of E. coli populations based upon detection of E. coli phage. (Holoman-Battelle)
W72-09109

DEVELOPMENT OF NUCLEAR ANALYTICAL TECHNIQUES FOR OIL-SLICK IDENTIFICATION, PHASE IIA, FINAL REPORT,
Gulf Radiation Technology, San Diego, Calif.
H. R. Lukens, D. Bryan, N. A. Hiatt, and H. L. Schlesinger.
Available from the National Technical Information Service as GULF-RT-A-10684, $3.00 in paper copy, $0.95 in microfiche. Report No. GULF-RT-A-10684, June 11, 1971. 113 p, 42 tab, 12 ref, 3 append. Project No. 4023, AEC Contract No. AT (04-3)-167.

Descriptors: *Oil, *Trace elements, *Neutron activation analysis, Oil spills, Statistical methods, Pollutant identification, Bromine, Sulfur, Manganese, Iodine, Nickel, Oil pollution, Heavy metals, Sampling.
Identifiers: *Oil characterization, Trace element patterns, Fingerprinting, Vanadium, Arsenic, Gallium, Indium, Barium, Zirconium, Dysprosium, Aluminum, Cobalt, Sodium, Chlorine, Crude oil, Bunker C oil, Weathering, Alaskan crude, Diesel fuel, Gas oil, Jet fuel, Base oil, Louisiana crude, Nigerian crude, Bolivian crude, Cabinda crude, Venezuelan crude, Heating oil, Oil residues, Lube oil, Gasoline, Methanol, Xylene, No. 2 fuel oil, No. 6 fuel oil, No. 1 fuel oil, Kerosene, Light oil, Murban crude, Katapa crude, San Ardo crude, Sumatran crude, Iranian crude, Nikiski crude.

A definition of the utility of the trace element patterns (TEP) of oil slicks and suspected sources of oil slicks, as measured qualitatively and quantitatively by neutron activation analysis (NAA), has been achieved. In the context of comparing slick and suspect TEP's, it is shown that the method will invariably select those pairs of samples that are the same, provided the suspect samples are exposed to simulated weathering and the set of slick and suspect samples are analyzed in unison. A method of objectively measuring differences in TEP's of sample pairs was developed. The concentration values were codified in a manner that provides equal weight to all values for all elements. The differences between code values, or scores, for each observed element in a pair of samples are summed to obtain a difference score (DS). The distributions of DS for matched pairs are significantly different from those of nonmatched pairs. The chance of mistakenly calling a nonmatched pair a matched pair is 0.0028 percent, while the chance of failing to identify a matched pair is less than 0.001 percent. (Mortland-Battelle)
W72-09110

ABUNDANCE OF YOUNG SCIAENID FISHES IN EVERGLADES NATIONAL PARK, FLORIDA, IN RELATION TO SEASON AND OTHER VARIABLES,
Miami Univ., Fla. Sea Grant Institution Program.
For primary bibliographic entry see Field 02L.
W72-09113

CONCURRENT SOLUTION AND ADSORPTION PHENOMENA IN GAS-LIQUID CHROMATOGRAPHY-A COMPARATIVE STUDY,
Georgetown Univ., Washington, D.C., Dept. of Chemistry.
H. L. Liao, and D. E. Martire.
Analytical Chemistry, Vol. 44, No. 3, p 498-502, March 1972. 4 fig, 3 tab, 17 ref.

Descriptors: *Gas chromatography, Adsorption, Alcohols, Chemical properties, Chemical analysis, Retention.
Identifiers: Chromatography columns, Gas-liquid chromatography, Octadecane, Propanol, Secondary butanol, Methylisopropylamine, Chromatography peaks, Errors, Partition coefficients, Partitioning, error sources.

With many compounds, particularly alcohols, solute adsorption on the solid support is a troublesome factor in GLC separations and in quantitative GLC studies of solution thermodynamics. A study was made of three methods for obtaining bulk liquid-gas partition coefficients (K sub L) from GLC retention measurements on solute-liquid phase systems where a multiple sorption mechanism leads to sample size-dependent peak maximum retention time and asymmetric peak shapes. The methods compared all involve retention measurements on several columns differing only in liquid phase weight per cent, followed by extrapolations to give infinite dilution bulk retention volumes. The test solutes studied on four n-octadecane columns at 40.0 C gave the following average K sub L values: n-propanol, 110.3; sec-butanol, 55.8; and methylisopropylamine, 106.8. Evidence is found for adsorption of the alcohols on the solid support and at the gas-liquid interface. The relative merits of the three approaches, which yield K sub L values in excellent agreement with each other, are compared. (Mackan-Battelle)
W72-09114

GAS CHROMATOGRAPH-MASS SPECTROMETER-ACCELERATING VOLTAGE ALTERNATOR SYSTEM FOR THE MEASUREMENT OF STABLE ISOTOPE RATIOS IN ORGANIC MOLECULES,
Argonne National Lab., Ill. Div. of Biological and Medical Research.
P. D. Klein, J. R. Haumann, and W. J. Eisler.
Analytical Chemistry, Vol. 44, No. 3, p 490-493, March 1972. 9 fig, 1 tab, 9 ref.

Descriptors: *Gas chromatography, *Mass spectrometry, Isotope studies, Stable isotopes, Laboratory equipment, Organic compounds, Deuterium, Acids, Chemical analysis, Instrumentation.
Identifiers: Chromatography peaks, Accelerating voltage alternation, Tetradeuterio-chenodeoxycholic acid.

A procedure and an instrument have been refined for stable isotope ratio analyses using a gas chromatograph-mass spectrometer with accelerating voltage alternation. In tests, a 5 microgram mixture of protio- and tetradeuterio-chenodeoxycholic acids were chromatographed as the acetates of their methyl esters on a 1-mm by 6 ft column

packed with 3 percent AN600 on a Gas Chrom Q, 80-100 mesh, and the results recorded. The system provided independent focusing for each mass, magnet stabilization, sweep options, and converted the output signal to digital form. Excellent stability was achieved providing measurement of carbon isotopic ratios with an accuracy of 1 part in 10,000. The limiting concentration of tetradeuterio-chenodeoxycholic acid measurable with significance is between 0.1-0.2 percent. (Mackan-Battelle)
W72-09115

SLOPE ANALYSIS FOR RECOGNITION AND CHARACTERIZATION OF STRONGLY OVERLAPPED CHROMATOGRAPHIC PEAKS,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W72-09116

REPORT ON PESTICIDE FORMULATIONS,
Environmental Protection Agency, Washington, D.C. Pesticides Regulation Div.
R. L. Caswell.
Journal of the Association of Official Analytical Chemists, Vol. 55, No. 2, 1972. p 244-246.

Descriptors: *Analytical techniques, Infrared radiation, Insecticides, Chlorinated hydrocarbon pesticides, Chromatography, Gas chromatography, Herbicides, Mercury, Pesticides, Pollutant identification, Heptachlor, Fertilizers, 2 4-D, 2 4 5-T, Colorimetry, Malathion, Paraquat.
Identifiers: Thin layer chromatography, Carbaryl, Chlordane, Chlorobenzilate, Prometone, Propazine, Simazine, Terbutryn, Dinocap, Kelthane, Pentachloronitrobenzene, Phosphamidon, Thiocarbamate, Trifluralin, N-Butyl-N-ethyl-alpha alpha alpha-trigluoro-2 6-dinitro-p-toluidine.

Several new methods of pesticide analysis that have been developed and studied are listed, although few studies were completed. No details are provided on these techniques. (Mortland-Battelle)
W72-09118

A LIST OF NEW GENERA AND TYPE SPECIES OF FLAGELLATES AND ALGAE PUBLISHED IN 1969, PART V,
B. V. Skvortzov.
Hydrobiologia, Vol 39, No. 2, p 241-245, February 29, 1972. 15 fig, 4 ref.

Descriptors: *Protozoa, *Systematics, *Algae, Chlorophyta, Habitats, Aquatic habitats, Euglenophyta, Pyrrophyta, Freshwater algae.
Identifiers: Protocryptochrysis obovata, Guttula bacillariophaga, Refractocystis pluvialis, Gomesiamonas stagnalis, Refractodes brasiliana, Oyemonas pulsulae, Refractomonas brasiliana, Hortobaggiamonas plicata, Trichocyanella spiralis, Stromia subsphaerica, Tetraculamonas natans, Mariniamonas saupaulensis, Eneidamonas applanata, Bicudomonas cyanophora, Liangiana terrestris, Chloromonads, Cryptomonads, Bicudomonas, *Flagellates.

A list of 15 new genera of flagellates and algae is given. Included are illustrations of the organisms, sizes of the cells, type species, and the habitats in which they may be found. (Mackan-Battelle)
W72-09119

SURVEY OF MACROPHYTE RESOURCES IN THE COASTAL WATER OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 02L.
W72-09120

A. DEGRADATION AND MINERALIZATION OF PETROLEUM BY TWO BACTERIA ISOLATED FROM COASTAL WATERS, B. DEGRADATION AND MINERALIZATION OF PETROLEUM IN SEA WATER: LIMITATION BY NITROGEN AND PHOSPHORUS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
R. M. Atlas, and R. Bartha.
Available from the National Technical Information Service as AD-735 142, $3.00 in paper copy, $0.95 in microfiche. Technical Report No. 2, December 31, 1971. 39 p, 11 fig, 1 tab, 39 ref. ONR Contract N00014-67-A-0115-0005.

Descriptors: *Marine bacteria, *Biodegradation, *Oil, Sea water , Degradation (Decomposition), Microbial degradation, Nitrogen, Phosphorus, Organic compounds, Gas chromatography, Mass spectrometry, Carbon dioxide, Oil spills, Oil pollution, Limiting factors, Cultures, Isolation, Separation techniques.
Identifiers: *Mineralization, *Substrate utilization, Flavobacterium, Brevibacterium, Paraffinic hydrocarbons, Aliphatic hydrocarbons, Sweden crude oil, Oil removal, Cleanup, Paraffins, Enrichment, Agars, Oil characterization, Chromatograms, Mass spectra, n-decane, n-undecane, n-dodecane, n-tridecane, n-tetradecane, n-pentadecane, n-hexadecane, pristane n-heptadecane, n-octadecane, n-nonadecane, n-eicosane, n-heneicosane, n-docosane.

Within the framework of a study on the oil biodegradation potential of the sea, the ability of a Flavobacterium sp. and Brevibacterium sp. to metabolize a paraffinic crude oil and a chemically defined hydrocarbon mixture was investigated. Major components of the crude oil were identified by combination gas chromatography and mass spectrometry. The rate and extent of total hydrocarbon biodegradation was measured. In addition, CO2 evolution from the crude oil was continuously monitored in a shaker-mounted gas train arrangement. Degradation started after a 2 to 4 day lag period and reached its maximum within two weeks. At this time up to 60 percent of the crude oil and 75 percent of the model hydrocarbon mixture, each added at the level of 1 ml per 100 ml artificial sea water, were degraded. Mineralization (conversion to CO2) was slightly lower due to formation of products and bacterial cell material. n-Paraffins were preferentially degraded as compared to branched chain hydrocarbons. Biodegradation of n-paraffins in the range of C12 to C20 was simultaneous; no diauxie effects were observed. Biodegradation and mineralization of petroleum, added at 1 percent (v/v) to freshly collected sea water, were measured using gas-liquid chromatographic, residual weight, and CO2-evolution techniques. Only 3 percent of the added petroleum was biodegraded and 1 percent was mineralized in unamended sea water after 18 days of incubation. Added individually, nitrate (0.01M) or phosphate (0.00035 M) supplements caused little improvement, but when added in combination, they increased petroleum biodegradation and mineralization to 70 percent and 42 percent, respectively. Attempts to clean up oil spills with the aid of microorganisms should take into consideration the nutritional deficiencies of sea water. (Holoman-Battelle)
W72-09121

CARBON DIOXIDE AND PRIMARY PRODUCTIVITY IN THE GLACIAL FIORD SYSTEM OF SOUTHEAST ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05C.
W72-09122

LABORATORY RELEASE RATES OF ENCAPSULATED MALATHION SLOW RELEASE FORMULATIONS, APRIL-JUNE 1971,
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05G.
W72-09123

LABORATORY EVALUATION OF RESIDUE LEVELS IN WATER TREATED WITH AN ENCAPSULATED MALATHION FORMULATION, JULY-SEPTEMBER 1971,
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05G.
W72-09124

DEPOSITION OF URANIUM IN THE SEDIMENT AND INTERSTITIAL WATER OF AN ANOXIC FJORD,
Hebrew Univ., Jerusalem (Israel). Dept. of Geology.
For primary bibliographic entry see Field 05B.
W72-09126

SECRETION OF DISSOLVED ORGANIC CARBON AND NITROGEN BY AQUATIC MACROPHYTES,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 05C.
W72-09127

ELECTROLYTIC CALIBRATION TECHNIQUE FOR DISSOLVED NITROGEN DETERMINATION IN SEAWATER BY ON-STREAM STRIPPING GAS CHROMATOGRAPHY,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
L. P. Atkinson.
Analytical Chemistry, Vol. 44, No. 4, p 885-887, April 1972. 2 fig, 6 ref.

Descriptors: *Sea water, *Nitrogen, *Analytical techniques, *Gas chromatography, Calibrations, Argon, Automation, Laboratory equipment, Hydrogen.
Identifiers: *Stripping gas chromatography, *Electrolytic calibration, Hydrazine sulfate, On board analysis, Dissolved nitrogen.

A gas chromatographic technique for determining the dissolved nitrogen content of seawater quickly, precisely, and accurately is described. The technique utilizes on-stream stripping and electrolyte calibration and is adaptable to automation. Water samples are pumped into a glass stripping chamber with a peristaltic pump. For calibration, a current is passed through a 0.1 M hydrazine sulfate solution held in the stripper. The electrolytic decomposition of hydrazine sulfate produces N2 and H2. A standard curve of milliamperes versus integrated nitrogen peak area is then used in calculating N2. Other gases can also be easily determined in this manner. Using this technique, the relative standard deviation is typically 0.5 percent for four samples. The total error in accuracy is estimated to be at most 0.5 percent. About 300 samples have been successfully analyzed both in the laboratory and aboard ship using this technique. (Mortland-Battelle)
W72-09128

FLAME DETECTION METHOD FOR DETERMINING ORGANIC CARBON IN WATER,
Shell Development Co., Emeryville, Calif.
F. T. Eggertsen, and F. H. Stross.
Analytical Chemistry, Vol. 44, No. 4, p 709-714, April 1972. 7 fig, 3 tab, 9 ref.

Descriptors: *Carbon, *Organic matter, *Aqueous solutions, *Analytical techniques, Pollutant identification, Ionization, Oil, Detergents, Alcohols, Acids, Organic compounds.
Identifiers: *Organic carbon, *Hydrogen flame ionization detector, Detection limits, TOC, Flame detector, Thermal analysis-flame ionization detector, TAFID, Gelatin, Heptanoic acid, Isopropyl alcohol, Acetic acid, Starch, NEODOL, Pyrolysis.

Trace organic carbon in water can be determined by means of a thermal analysis-flame detection system previously devised for the thermal stability and volatility characterization of organic materi-

als. The method seems to be applicable for samples that are essentially hydrocarbon in nature and from which substantially complete recovery of organic carbon is obtained upon pyrolysis at 550C. Thus a satisfactory analysis for oils, solvents, and ready pyrolyzable material can be made with differentiation according to volatility. In the method developed, a small sample is heated in nitrogen carrier gas in two stages to determine volatile (less than 150C) and nonvolatile (150-550C) organic carbon with the hydrogen flame ionization detector. The water evaporated in the first stage changes the detector response to some extent but this is taken care of by calibration. Performance of the method is illustrated in tests with 1 to 300 ppm of various types of organic material with a lower limit of detection of about 0.2 ppm. Advantages of the method are its simplicity and sensitivity and a differentiation of the organic material according to volatility. The analysis time is about 15 minutes. (Mortland-Battelle)
W72-09129

ACID INTERFERENCES IN ATOMIC ABSORPTION SPECTROMETRY,
Perkin-Elmer Corp., Norwalk, Conn.
W. B. Barnett.
Analytical Chemistry, Vol. 44, No. 4, p 695-698, April 1972. 5 fig, 2 tab, 9 ref.

Descriptors: *Acids, Spectrometers, *Copper, *Chromium, *Manganese, *Nickel, *Spectrophotometry, Heavy metals.
Identifiers: *Atomic absorption spectrophotometry, *Chemical interference, Flame spectrometry, Mineral acids, Hydrochloric acid, Nitric acid, Perchloric acid, Sulfuric acid, Phosphoric acid.

A study was made of the interferences caused by five mineral acids (hydrochloric, nitric, perchloric, phosphoric, and sulfuric) during determination of copper, chromium, manganese, and nickel by atomic absorption spectrophotometry. Variations in acid concentration, flame type, and flame stoichiometry were examined. It was found that interference is minimal during determination of Cu, Mn, and Ni when using an air-acetylene flame burning on a single, flat-top burner. With Cr, both air-acetylene and nitrous oxide-acetylene flames produced roughly equivalent sensitivities and acid interferences. Interferences were least from hydrochloric and nitric acids, indicating they should be used if there is a choice of dissolution methods. It also became clear that design of the burner system has an important influence on analytical interferences. (Mortland-Battelle)
W72-09130

THE DETERMINATION OF ATOMIC ABSORPTION DETECTION LIMITS BY DIRECT MEASUREMENT,
Perkin-Elmer Corp., Norwalk, Conn.
For primary bibliographic entry see Field 02K.
W72-09131

MODIFICATION OF THE ANALYSIS OF PHOSPHOROUS AND KINETICS OF THE REACTION,
Hadassah Medical School, Jerusalem (Israel). Dept. of Virology.
L. H. Lazarus, and S.-C. Chou.
Analytical Biochemistry, Vol. 45, No. 2, p 557-566, February 1972. 7 fig, 1 tab, 27 ref.

Descriptors: *Phosphorus, *Kinetics, *Phosphorus compounds, Phosphates, Chromatography, Hydrolysis, Nutrients, Assay, Chemical analysis, Absorption.
Identifiers: *Orthophosphates, *Aminonaphthosulfonic acid, Esters, Phosphate esters, Adenosine triphosphate, Phosphoenolpyruvate, Ribose 1-phosphate, Phosphocreatine, Acetyl phosphate, Molybdenum blue.

The modification of an existing technique for determination of phosphorus has led to a simple and rapid method for its detection. Aminonaphtholsulfonic acid (ANSA) was used as a reducing agent and a reduction in the assay volume, while maintaining an appropriate acid molybdate ratio, resulted in increased sensitivity. Both orthophosphate and total phosphate were determined at 740 millimicrons 10 min. after addition of assay components. Reaction rates for kinetic analysis were automatically recorded on a chromatographic recorder. The kinetics of the formation of the molybdenum blue color for orthophosphate and several labile phosphate esters were determined. (Mortland-Battelle)
W72-09132

5B. Sources of Pollution

EQUILIBRIUM DISTRIBUTION OF SMALL ORGANIC MOLECULES IN NATURAL WATERS,
Southern Methodist Univ., Dallas, Tex. Dept. of Geological Sciences.
D. C. Thorstenson.
Geochimica et Cosmochimica Acta, Vol 34, No 7, p 745-770, 1970. 8 fig, 10 tab, 34 ref, append. NSF Grant GA-828.

Descriptors: *Equilibrium, *Organic compounds, *Molecular structure, *Natural streams, Oxidation-reduction potential, Organic matter, Model studies, Computer models, Methane, Hydrogen ion concentration, Water temperature, Water chemistry, Chemical reactions, Decomposing organic matter.
Identifiers: Acetic acid, Butyl alcohol.

Equilibrium and mass transfer calculations were investigated in describing the chemistry of small organic molecules in natural aqueous systems, with particular emphasis on their role in determining the pH and oxidation potential of natural waters. Predictions based on the calculated equilibrium distribution of these species are compared with data from several natural environments. The term 'small organic molecules' is arbitrarily defined to include any molecular or ionic species in the system C-N-S-H2O in which the sum of the C, N and S atoms is five or less. Examples of some typical species are methane, acetic acid, cyanide ion, butyl alcohol, and carbonate ion. The decomposition and solution of organic matter, whether by bacterial decay or by purely physico-chemical processes, ultimately introduces dissolved organic species into the associated aqueous phase. The equilibrium distribution of these dissolved small organic molecules can be predicted on a thermodynamic basis, and the model by which this is accomplished is discussed. (Woodard-USGS)
W72-08501

THE OCCURRENCE OF ALKANES IN FULVIC ACID, A SOIL HUMIC FRACTION,
Department of Agriculture, Ottawa, (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 02G.
W72-08502

NITROGEN FIXATION BY BLUE-GREEN ALGAE IN YELLOWSTONE THERMAL AREAS,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W72-08508

IMPACT OF HIGHWAYS ON THE HYDROGEOLOGIC ENVIRONMENT,
Pennsylvania State Univ., University Park. Coll. of Earth and Mineral Sciences.
For primary bibliographic entry see Field 04C.
W72-08516

A STUDY OF ENVIRONMENTAL POLLUTION BY LEAD,
Illinois Univ., Urbana. Dept. of Engineering.
R. B. Snyder, D. J. Wuebbles, J. E. Pearson, and B. B. Ewing.
Illinois Institute for Environmental Quality Final Report No 71-7, November 1971. 149 p, 18 fig, 35 tab, 126 ref, append.

Descriptors: *Water pollution sources, *Air pollution, *Lead, *Environmental effects, *Illinois, Reviews, Foods, Ecology, Gasoline, Solubility, Water quality standards, Analytical techniques.
Identifiers: *Lead pollution.

Current literature concerning lead in the environment, and data obtained from cities and governmental agencies of the State of Illinois are reviewed. The production and utilization of lead, lead in the atmosphere, in water, and food, and the health effects of lead are discussed. Also included are methods of environmental surveillance and abatement technology. People are being subjected to lead concentrations, particularly in food and urban air, which are not far below those levels which result in overt symptoms of lead poisoning. The subclinical effects of chronic exposure to current lead levels in the environment are unknown. The need to reduce environmental burden of lead primarily through reduced use of lead-containing gasoline is emphasized. Other control measures and needs for further research are discussed. (Woodard-USGS)
W72-08518

POLLUTION PATHWAYS IN THE GREAT LAKES,
J. W. Winchester.
Limos, Vol 1, No 1, p20-24, Spring 1968. 4 fig.

Descriptors: *Great Lakes, *Water pollution sources, *Water pollution control, Monitoring, Biology, Economics, Aesthetics, Elements (Chemical), Sampling.
Identifiers: *Pollution pathways.

The Great Lakes are peculiarly vulnerable to water pollution. At the present time, countless organic and inorganic substances are entering the lakes from municipal, industrial, and agricultural sources, far faster than the Lakes can flush them out. Very few of these substances are being monitored or controlled, and research on the Great Lakes chemistry cannot keep up with the task of studying the biological, economic, and aesthetic consequences of pollution. Four problem areas of pollution control research are listed. (1) The majority of elements of periodic table have not been measured a single time in any water sample of the Great Lakes. (2) A bank of systematically collected and preserved water samples taken each year would provide the means to judge rates of increase of water pollution levels. There is no such sampling carried out in the Great Lakes. (3) The biological effects of most of the elements in the periodic table and of many organic compounds currently added to water are essentially unknown. (4) Pollution of the Great Lakes would cause catastrophic economic losses. (Strachan-Chicago)
W72-08532

THE LAND (1): ITS FUTURE-ENDANGERING POLLUTANTS,
D. E. Elrick.
Impact of Science on Society, Vol 19, No 2, p 195-207, 1969. 1 fig, 6 ref.

Descriptors: *Planning, *Soil contamination, *Soil contamination effects, *Pollution abatement, Path of pollutants, Political aspects, Lane use, Long-term planning.
Identifiers: *Land pollution, Interest groups, Motivated public.

Soil pollution will become an overwhelming problem if proper planning is not carried out immediately. The major sources of soil contamination are: agriculture, industry, and population ag-

glomerations. The nature of soil, and the pathways of pollutants through the soil are discussed. Pesticides, fertilizers, minerals, waste disposal, and radio-active contamination are all conveyors of pollution to the soil. Careful and wise planning is demanded. More technical information is needed about land pollution. There is no substitute for sound planning of land use, backed by effective legislation. A broad systems approach is needed to take into account all factors bearing on this particular problem. Land-use planning must aim to achieve sould location of industry, housing, and means of transportation while assuring the best use of the land for agriculture and recreation. Responsible political bodies must take measures to ensure exploitation of the great potential of soil for decomposing organic materials, in order to achieve effective waste disposal and utilization. Compormises will have to be made between the various interest groups. For the most part, the technology is available. Solutions of pollution problems depend upon a public sufficiently motivated to insist that certain necessary measures be taken. (Strachan-Chicago)
W72-08538

FLUX OF RADIONUCLIDES THROUGH A SALT MARSH ECOSYSTEM -- PROGRESS REPORT FOR JAN. 1, 1971 TO DEC. 30, 1971.
Georgia Univ., Athens. Dept. of Zoology.

Available from the National Technical Information Service as SR-639-11, $3.00 in paper copy, $0.95 in microfiche. December 30, 1971. 17 p. AEC AT 38-1- (639).

Descriptors: *Radioactivity, *Radioactivity effects, *Salt marshes, Water flow, Flow measurement, Model studies, Experimental models, Computer models, Statistical models, Research facilities, Phosphorus, Mathematical models, Equations, Ecosystems.
Identifiers: Flux, Concentration, Model testing.

Tests were made of the results of modeling the flux of phosphorus through a salt marsh by manipulation of the marsh within experimental enclosures. The enclosures are open, so water comes and goes freely, but the water flow can be measured and samples of it taken by automatic sampling equipment. Construction of the enclosures and installation of the sampling equipment were completed. Also work continued with the nonlinear model of phosphorus flux. Emphasis was placed on the use of double-precision Runge-Kutta solutions for the differential equations used to express the flux of phosphorus through the salt marsh and estuary. This was employed to determine the optimum iterative interval for each set of initial conditions. This type of solution methodology provides an approximate solution of a system of first-order ordinary differential equations with given initial values. (Houser-ORNL)
W72-08545

ENVIRONMENTAL RADIOACTIVITY IN GREENLAND IN 1970,
Danish Atomic Energy Commission, Roskilde. Health Physics Dept.
For primary bibliographic entry see Field 05A.
W72-08547

EVALUATION OF THE PROJECT DRIBBLE SITE, HATTIESBURG, MISSISSIPPI, FOR DISPOSITION INCLUDING IDENTIFICATION OF RESTRICTIONS,
Teledyne Isotopes, Palo Alto, Calif.
For primary bibliographic entry see Field 05G.
W72-08548

ACTIVATION ANALYSIS AS A METHOD FOR TRACING SUSPENDED SEDIMENTS,
Puerto Rico Nuclear Center, Mayaguez.
B. M. Aviles, and K. B. Pedersen.

Available from the National Technical Information Service as PRNC-142, $3.00 in paper copy, $0.95 in microfiche. (1969). 35 p, 21 ref.

Descriptors: *Settling velocity, *Sediment transport, *Discharge measurement, Rivers, Analytical techniques, Neutron activation analysis, Aluminum, Filtration, Estuarine environment, Path of pollutants.

Naturally-occurring Al was used for determining the distribution and settling rate of river water sediment in the Mayaguez Bay area, where the concentration was about 100 times greater than in standard sea water. Only the sediment retained on a 0.45 micron millipore filter was irradiated for neutron activation analysis, in order to reduce interference from sodium chloride. (Bopp-ORNL)
W72-08549

BIOENVIRONMENTAL-EFFECTS PREDICTIONS FOR THE PROPOSED CANNIKIN UNDERGROUND NUCLEAR DETONATIONS AT AMCHITKA ISLAND, ALASKA,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
For primary bibliographic entry see Field 05C.
W72-08552

NUCLEAR CRATERING EXPLOSION EFFECTS FOR INTEROCEANIC CANAL FEASIBILITY STUDIES.
Nevada Operations Office (AEC), Las Vegas.

Available from the National Technical Information Service as NVO-67 (Rev 1), $3.00 in paper copy, $0.95 in microfiche. November 1971, A. W. Klement, Jr., editor, 154 p, 28 fig, 8 tab, 78 ref.

Descriptors: *Nuclear explosions, *Excavation, *Food chains, *Seismic studies, Hazards, Reviews, Radioactivity effects, Water pollution effects, Path of pollutants, Systems analysis, Forecasting, Fallout, Hydrologic aspects, Pollution abatement, Water pollution control, On-site investigations, Neutron absorption, Radioisotopes, Absorption, Canal construction, Ecosystems, Rivers, Estuaries, Watersheds (Basins), Feasibility studies.

Prediction techniques for hazards associated with nuclear excavation are reviewed. Radionuclide transport is modelled into food chains and man (about 70% of the report), and effects on structures are estimated from the air blast and ground motion. The calculations show deposition, including precipitation scavenging through thunderstorms, into watersheds, rivers, and estuaries. A generalized 10-compartment transport model is specialized for plant edibles, plant leaves, soil water, freshwater and marine fish, and man. (Bopp-ORNL)
W72-08553

SOURCE TO RECEPTOR TRANSPORT OF NUCLEAR FACILITY EFFLUENT AND DOSE CALCULATIONS,
Wadco Corp., Richland, Wash.; and Hanford Engineering Development Lab., Richland, Wash.
W. L. Dotson.
Available from the National Technical Information Service as HEDL-SA-275, $3.00 in paper copy, $0.95 in microfiche. November 1971, 36 p.

Descriptors: *Nuclear powerplants, *Nuclear energy, *Nuclear wastes, *Effluents, *Computer models, Population, Ion transport, Meteorology, Path of pollutants, Food chains, Radioactivity effects.
Identifiers: Deposition, Concentration, Dose calculation.

Calculation of the radiological effects in the year 2000 due to nuclear facility operation requires the development of a number of computer models to characterize receptor characteristics, transport processes, and dose evaluation. The release patterns, discussed in a companion paper, provide input to aerial and water transport computer programs. These programs calculate deposition and concentrations at points of interest throughout the region. Radiological doses for various organs of typical individuals ar calculated at these points in the region. A detailed analysis of the demographic food production, food consumption, work habits, and recreational practices in the study region was made and used as the basis for development of a receptor map. (Houser-ORNL)
W72-08554

NUTRIENT LOSSES FROM AGRICULTURAL LAND,
Imperial Chemical Industries Ltd., Jealott's Hill (England). Jealott's Hill Research Station.
For primary bibliographic entry see Field 05C.
W72-08565

EFFECT OF LITHIUM ON GROWTH, SALT ABSORPTION, AND CHEMICAL COMPOSITION OF SUGAR BEET PLANTS,
Ministry of Agriculture, Cairo (Egypt). Div. of Plant Nutrition.
For primary bibliographic entry see Field 03F.
W72-08570

AQUIFER PERFORMANCE TESTS UNDER TWO-PHASE FLOW CONDITIONS,
Alabama Univ., University. Natural Resources Center.
For primary bibliographic entry see Field 02F.
W72-08591

THE FREE AMINO ACIDS IN THE SEDIMENTS OF TORONTO HARBOR,
Toronto Univ. (Ontario). Dept. of Zoology.
R. O. Brinkhurst, K. E. Chua, and E. Batoosingh.
Limnology and Oceanography Vol 16, No 3, p 555-559. 1971. Illus.
Identifiers: *Amino acids, Canada, *Water pollution, *Sediments, Toronto Harbor.

Seventeen amino acids were extracted from Toronto Harbor sediments, in concentrations that varied throughout the study period. Their relative abundance was the same at 2 locations, although the concentrations were significantly higher near the mouth of the polluted Don River than near the islands.--Copyright 1972, Biological Abstracts, Inc.
W72-08608

THE MECHANISM OF COAGULATION OF WASTE FROM A SYNTHETIC RUBBER PLANT,
Hercules Inc., Houston, Tex.
For primary bibliographic entry see Field 05D.
W72-08679

FUNDAMENTALS OF ODOR CONTROL,
Iowa Univ., Iowa City. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-08681

COMPUTER SIMULATION OF LARGE SCALE POLLUTANT DISPERSION IN LAKE ERIE,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
F. M. Galloway, Jr., and K. A. Skarupa.
Preprint, presented at American Institute of Chemical Engineers National Meeting, 71st, Symposium on Urban Systems Analysis, Paper No. 6C, February 20-23, 1972, Dallas, Texas, 17 p, 15 ref.

Descriptors: *Lake Erie, *Model studies, *Dispersion, Analytical techniques, Computer models, Continuity equations, Turbulence, Viscosity, Currents (Water), *Path of pollutants, *Ecosystems.

Identifiers: *Finite difference approximations, *Boundary conditions.

A predictive model for large scale pollutant dispersion and algal blooms has been developed for Lake Erie. Since the model is based on numerical integration of one transport equation for each chemical and biological parameter considered, detailed velocity measurements are required as input for the convective terms. The model has been assembled such that improvements in the velocity calculations, turbulent diffusion coefficients, and chemical/biological interactions can be readily incorporated into the basic structure with little alteration. This preliminary model is limited to the western basin, isothermal conditions, various predominant steady state lake currents and conservative pollutants. The ultimate objective is to expand the model to cover the entire Lake Erie without the limitations. Such a model is vital to the overall ecosystem modeling of Lake Erie, since it can provide the needed time and space dependent concentrations information for the various chemical and passively transported biological species involved. (Lowry-Texas)
W72-08682

THE EFFECTS OF THERMAL LOADING AND WATER QUALITY ON ESTUARINE PRIMARY PRODUCTION,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 05C.
W72-08706

CURRENTS AND DIFFUSION OF LAKE BAIKAL WATERS (TECHENIYA I DIFFUZIYA VOD BAYKALA).
Limnologicheskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 02H.
W72-08710

BOUNDARY OF FLOODWATER ZONES AT THE SOUTHERN END OF LAKE BAIKAL (RASPROSTRANENIYE PAVODOCHNYKH VOD V YUZHNOM BAYKALE),
Limnologicheskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 02H.
W72-08712

USE OF FLUORESCEIN DYE CLOUDS TO STUDY HORIZONTAL DISPERSION AT THE SOUTHERN END OF LAKE BAIKAL (ISSLEDOVANIYE GORIZONTAL'NOY DIFFUZII V YUZHNOM BAYKALE S POMOSHCH'YU PYATEN FLUORESTSEINA),
Limnologicheskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 02H.
W72-08713

APPLICATION OF THE ISOTOPIC METHOD TO STUDY OF MIXING PROCESSES IN LAKE BAIKAL (PRIMENENIYE IZOTOPNOGO METODA DLYA IZUCHENIYA PROTSESSOV VODOOBMENA OZERA BAYKAL),
Limnologicheskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 02H.
W72-08714

VERTICAL DISTRIBUTION OF ORGANIC--MATTER DECOMPOSITION PRODUCTS IN BOTTOM SEDIMENTS (O VERTIKAL'NOM RASPREDELENII PRODUKTOV RASPADA ORGANICHESKOGO VESHCHESTVA V DONNYKH OTLOZHENIYAKH),
Limnologicheskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 02H.
W72-08715

DISTRIBUTION OF MULTISTAGE DECOMPOSITION PRODUCTS OF ORGANIC MATTER IN BOTTOM SEDIMENTS (O RASPREDELENII PRODUKTOV MNOGOSTADIYNOGO RASPADA ORGANICHESKOGO VESHCHESTVA V DONNYKH OTLOZHENIYAKH),
Limnologicheskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 02H.
W72-08716

PSEUDOMONAS FLUORESCENS VAR. PSEUDOIODINUM, (IN GERMAN),
Cologne Univ. (West Germany). Hygienishces Institut.
Heinz Korth.
Zentralbl Bakteriol Parasitenk Infektionskrankh Hyg Abt I Orig. 215 (4): 461-465. 1970. Illus. English summary.
Identifiers: Pseudomonas-Fluorescens-Var-Pseudoio.

A bacterium isolated from groundwater and characterized as P. fluorescens produces a violet pigment in a culture medium containing glucomate as the C source. This pigment which is similar to pyocyanin has a remarkably high N content, formed only in the presence of Fe. In an Fe-free medium, only fluorescein was detected. When isolated, this violet pigment forms iodine-like crystals. It is proposed that this variation be identified as P. fluorescens var. pseudoiodinum. In a growing culture this pigment is reduced to a colorless substance which when aerated, is re-oxidized to the violet pigment. It forms a redox system with its hydro derivative similar to alphaphenazine carboxylic acid.--Copyright 1971, Biological Abstracts, Inc.
W72-08758

ON THE RELATION BETWEEN THE DISTRIBUTION OF CHLORINE CONTENT IN RAIN WATER AND THE LANDFORMS IN THE NORTHERN TOHOKU DISTRICT, (IN JAPANESE),
Tomoo Inoue, and Jishin Kobayashi.
Misc Rep Res Inst Nat Resour. 75. 73-80. 1971. Illus. Maps. English summary.
Identifiers: Chlorine, Distribution, Forms, Japan, Land, Northern, Pollution, Rain, Relation, Tohoku.

Rain water on the Japan Sea side has a tendency to contain a large amount of Cl in comparison with the Pacific Sea side of this district. Chlorine concentration in rain water is affected by the sea salt along plain and river valley even in an inland region. When the wind transporting sea salt goes over a mountain, most of the sea salt in rain water tends to drop out on the front slope side rather than on the reverse slope side of the mountain. The composition of elements in rain water may also be affected greatly by pollution.--Copyright 1971, Biological Abstracts, Inc.
W72-08765

MERCURY IN FISH AND FISH-EATING BIRDS NEAR SITES OF INDUSTRIAL CONTAMINATION IN CANADA,
University of Western Ontario, London. Dept. of Zoology.
N. Fimreite, W. N. Holsworth, J. A. Keith, P. A. Pearce, and I. M. Gruchy.
Can Field Nat. 85 (3): 211-220. 1971. Maps.
Identifiers: Birds, Canada, Contamination, Eating, Fish, Grebe, Hazard, Human, Industrial, Mercury, Sites, Tern, Trout, Walleye.

Concentrations of Hg were determined in fish muscle, livers and eggs of fish-eating birds, and bivalve molluscs. Most of the material was collected near sites of industrial contamination: a Hg mine, chlor-alkali plants and pulp mills known to use or have used Hg. Most sites showed substantial Hg contamination, especially downstream from the above sources. Hg levels exceeding 0.5 ppm were found in practically all samples of freshwater fish. Individual walleye (Lake St. Clair), pumpkinseed (St. Clair River), and lake trout (Pinchi Lake) contained concentrations up to 5.01, 7.09, and 10.50 ppm of Hg respectively. Lower levels were found in marine fishes from coastal waters. A positive correlation was found between body weight and Hg concentration in most fish samples, and also between the trophic feeding level and Hg concentration in both fish and fish-eating birds. The highest Hg level in the livers of fish-eating birds was 17.40 ppm (Red-necked grebe). Four common tern eggs averaged 0.58 ppm and 2 Red-breasted merganser eggs averaged 0.81 ppm. The Hg concentrations are discussed in terms of published data on hazard to human health and to reproduction in fish-eating birds.--Copyright 1972, Biological Abstracts, Inc.
W72-08789

ORGANIC PESTICIDES IN THE AQUATIC ENVIRONMENT,
Missouri Univ., Rolla Rolla. Dept. of Civil Engineering.
J. C. Huang.
Water and Sewage Works, Vol 118, No 5, p 139-144, May 1971. 7 fig, 35 ref.

Descriptors: *Water quality, *Aquatic environment, Insecticides, *Pesticides, Degradation (Decomposition), *Chlorinated hydrocarbon pesticides, Volatility, Sorption, *DDD, Microbial degradation, Chemical degradation.
Identifiers: Hydrophobic.

The volatilization of pesticides, their decomposition by ultraviolet irradiation, chemical and microbial degradation, biological magnification, and sorption and desorption from suspended matter are discussed. The rate of volatilization depends primarily on the nature of the compound but to some extent on environmental factors in the aqueous system. Some pesticides, especially those containing aromatic rings in their molecular structures, can be excited and decomposed by ultraviolet light. Some chlorinated hydrocarbons are readily decomposed under certain conditions, however, most are chemically stable in the natural aquatic system. Chlorinated hydrocarbons are extremely persistent in soil systems; residues can be detected many years after application, however results indicate that all of the tested pesticides show some degradation under suitable biologically active conditions. Dosage of 14 micro g/l DDD (TDE) was applied to a lake. It was later found that plankton in the lake contained 5 mg/gram and fish accumulated 40 to 2500 mg/l in their fat. Most chlorinated hydrocarbons are extremely hydrophobic in nature and can be easily adsorbed by suspended matter. The fate of a particular pesticide will vary in different aquatic systems. (Bean-AWWARF)
W72-08799

THE ORGANIC MATTER BUDGET OF A CENTRAL TEXAS RESERVOIR,
Baylor Univ., Waco, Tex. Dept. of Biology.
O. T. Lind.
In: Reservoir Fisheries and Limnology. Special Publication No 8, American Fisheries Society, Washington, 1971, G. E. Hall, editor, p 193-202.

Descriptors: *Organic matter, *Reservoirs, *Water properties, Texas, Pre-impoundment, Post-impoundment, Primary productivity, Streams, Discharge (Water).

The annual gain of organic matter by a 7500 acre reservoir was 170 x 109 kilocalories. Allochthonous input from four tributaries was 50 x 109 kilocalories. Autochthonous primary production was 168 x 109 kilocalories. Discharges lost 48 x 109 kilocalories. Reservoir construction on the stream system had little influence on quantity of organics being received downstream since tributary input and discharge output were approximately equal; however, the form was considerably changed with soluble organics making up a larger proportion of the discharge. The reservoir also assured organic-dependent communities downstream a more constant supply without the

marked seasonal fluctuations of organic transport typical of unimpounded streams.
W72-08801

MARINE WASTE DEPOSITS NEAR NEW YORK,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
M. G. Gross.
Marine Pollution Bulletin, Vol 3, No 4, p 61-63, April 1972. 4 fig, 4 ref. Grant No EP-00388. USAEC Contract DACW-72-70-C009.

Descriptors: *Waste disposal, *Bottom sediments, *Harbors, *New York, Estuaries, Continental shelf, Sewage effluents, Sludge disposal, Surveys, On-site data collection, Parametric hydrology, Carbon, Organic wastes, Lead, Copper, Water pollution sources.
Identifiers: *Marine waste deposits, New York Harbor.

The effects of effluent discharges and sludge dumping in New York Harbor and New York Bight are described from surveys made in 1970. About 45 sq km of coastal waters around the New York Metropolitan area contain deposits with more than 2% total carbon or 5% volatile matter, and about 100 sq km contain more than 1% total carbon. In New York Harbor about 160 sq km, or 41% of the harbor, is covered by fine grained wastes containing more than 2% total carbon, largely from sewage solids. Assuming that carbon-rich deposits indicate waste accumulation on the continental shelf, lead and copper prove to be the most useful elements for mapping the distribution of wastes. Total lead concentrations in waste deposits were more than ten times average lead concentration in marine organisms or shale. Maps show values found for total carbon and total lead concentrations and the distribution of carbon-rich sediments in the harbor and on the continental shelf nearby. (Lang-USGS)
W72-08803

BENTHIC ALGAE IN POLLUTED ESTUARIES,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W72-08804

EFFECTS OF ROAD SALT ON A VERMONT STREAM,
Forest Service (USDA), Milwaukee, Wis. Eastern Region.
S. H. Kunkle.
Journal of the American Water Works Association, Vol 64, No 5, p 290-295, May 1972. 6 fig, 6 tab, 16 ref.

Descriptors: *Water pollution sources, *Vermont, *Deicers, *Snow removal, Chlorides, Salts, Path of pollutants.
Identifiers: Highway deicing, Road salts.

Deicing roads by salting them may or may not reduce accidents, but salting roads definitely does raise the salt level of streams that flow nearby. Highway deicing chemicals, especially sodium chloride, are used liberally during winter months in many areas. The total volume of deicing chemicals used in the US probably exceeds 2 million tons per year. Road salt investigations were carried out in the Sleepers River basin, Vermont, between 1968 and 1970. The topography is rolling, like most of the region, with slopes of 10% to 40% common. Soils are mostly permeable sandy loams and loams several meters deep. A 4-km section of US Highway 2 traverses the research basin just west of St. Johnsbury, Vt. Salt concentrations in the highway-influenced stream peaked during summer baseflow, not during winter or spring as might be expected. Peak chloride concentrations during the summer dry period indicated that some of the road salt found its way into soils, then into subsurface flows, and finally emerged in summer's groundwater inputs into the stream. Individual seeps sampled near the highway showed chloride levels exceeding 200 mg/liter. Chloride levels in the stream did not exceed 100 mg/liter. Problem concentrations could arise where a salt-contaminated stream empties into a town water-supply reservoir. (Knapp-USGS)
W72-08808

HYDROLOGY OF THE RICEBORO AREA, COASTAL GEORGIA,
Geological Survey, Atlanta, Ga.
T. R. Dyar, G. D. Tasker, and R. L. Wait.
Final Report to Georgia Water Quality Control Board and Interstate Paper Corporation, 1972. 74 p, 21 fig, 2 plate, 7 tab, 21 ref.

Descriptors: *Pulp wastes, *Groundwater resources, *Estuaries, *Water pollution effects, *Path of pollutants, Dye releases, Water quality, Withdrawal, Groundwater, Drawdown, Water resources development, Waste disposal.
Identifiers: *Riceboro (Ga).

The hydrology and geohydrology of the North Newport estuary near Riceboro, Georgia, were studied during 1966-69 to determine possible effects of paper mill effluent on the estuarine environment and the effects of withdrawal of 10 to 50 mgd of groundwater on the aquifer system. Groundwater is being pumped at the rate of 9 mgd from the principal artesian aquifer at the mill site. Transmissivity and storage coefficients of 1,000,000 gpd per ft and 0.0004 suggest that potential yield is large and that water levels will be affected at Savannah and Brunswick by pumping at Riceboro. Chemical quality of the groundwater is suitable for most uses. The range from high to low tide in the Newport estuary is relatively uniform to mile 25 and averages about 7 1/2 feet. Average fresh-water runoff of the Newport River basin is about 0.6 cubic feet per second per square mile. Two estuarine samples indicated dissolved oxygen less than 4 mg/liter. Epifaunal surveys did not reveal deleterious effects from discharge of mill effluent. Rhodamine WT dye and fresh-water movement were used to measure effluent movement and dispersion. Dispersion coefficients were 150 sq ft per sec near mile 20 and ranged from 180 to 240 sq ft per sec near mile 16. A buildup of effluent of about 20% was estimated by tracer studies at Halfmoon Landing when continuous discharge at the mill was 10 mgd. (Knapp-USGS)
W72-08817

A STOCHASTIC MODEL DESCRIBING THE WATER MOTION IN A RIVER,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Mathematics.
For primary bibliographic entry see Field 02E.
W72-08819

WHAT DO WE KNOW ABOUT SALT WATER INTRUSION,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
A. A. I. Kashef.
Water Resources Bulletin, Vol 8, No 2, p 282-293, April 1972. 4 fig, 110 ref.

Descriptors: *Saline water intrusion, *Saline water-freshwater interfaces, *Path of pollutants, *Aquifers, *Groundwater movement, Encroachment, Reviews, Bibliographies.
Identifiers: *Ghyben-Herzberg theory.

Although the Ghyben-Herzberg theory is based on oversimplified assumptions, it has stimulated other theories. The main investigations in this field are reviewed. The discussions are subdivided into three main areas: (1) The period through which the problems were identified and field observations were explained (from 1855 until the early forties); (2) the analytic approaches during the period from 1940 to the late sixties; and (3) the refined techniques during the past three years. A brief summary of the recharge methods is given in addition to a comprehensive list of references. (Knapp-USGS)
W72-08950

DREDGING DISPOSAL: REAL OR IMAGINARY DILEMMA,
Corps of Engineers, Boston, Mass. New England Div.
V. L. Andreliunas, and C. G. Hard.
Water Spectrum, Vol. 4, No. 1, p 17-21, Spring 1972. 6 photo.

Descriptors: *Dredging, *Waste disposal, *Oceans, *Water pollution, *Spoil banks, Sediment control.
Identifiers: *Ocean pollution, *Coastal zone management, Criteria, Biological aspects.

The assumption that the disposal of dredged material, which makes up the greater bulk of solid materials deposited in the ocean by man, constitutes a major source of pollution in the seas is investigated. Subjects discussed are: advisability of moving disposal areas, problems of heavy metals, the physical behavior of the sediment when dropped in the ocean water, toxic wastes, and highly organic wastes. An intensive program of study and research represents the cornerstone for an important aspect of coastal zone management. Whatever criteria are adopted for disposal area selection and use will involve tradeoffs against fishing, mining, and recreation. The basic criteria, to be used in the light of the degree of dispersal or containment desired, are: physiography and sea floor sediment of a particular area, current regime, nature of the dredged material, and the biological community of the area. The Continental Shelf will have to be mapped and classified according to these criteria. The need for greater knowledge of ocean disposal is implicit. All possible resources must be brought to bear on these problems in coordinated programs of research and experimentation. (Strachan-Chicago)
W72-08955

MANAGEMENT OF NUTRIENTS ON AGRICULTURAL LAND FOR IMPROVED WATER QUALITY.
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.

Copy available from GPO Sup Doc, $1.25; microfiche from NTIS as PB-209 858, $0.95. Environmental Protection Agency Water Pollution Control Research Series, August 1971, 151 p, 42 fig, 16 tab, 29 ref. EPA/EP2.10:13020 DPB 08/71.

Descriptors: *Surface runoff, *Rotation, *Nutrients, Fertilizers, Rainfall simulators, Crops, *Farm wastes, Farm management.
Identifiers: *Nutrient losses, *Crop management.

A rainfall simulator was utilized to determined the effects of 2-, 10-, and 20-year storm frequencies on losses of water, soil and nutrients from plots subjected to different crop rotations, fertilizer schemes and manure applications. Crop rotations, rates of fertilizer and manure were compared. Simulations were made on freshly tilled soil. Comparative erosion losses were as follows: continuous sod-corn-alfalfa rotations continuous corn. Fertilizer alone tended to increase runoff, but this effect was overcome when fertilizer was used with manure. Continuous recording of surface and subsurface flow and subsequent losses of nutrients to the environment was conducted on larger plots. Rate and time of fertilization determined the plant nutrients lost. Returning crop residues to the soil improved water infiltration, increasing deep seepage losses. Proper timing of fertilizer applications could control adverse environmental effects. Phosphorus inputs into cultural media as it related to algal growth was studied. Sustained concentration determined the biomass of phosphorous.
W72-08981

EUTROPHICATION FACTORS IN NORTH CENTRAL FLORIDA LAKES,
Florida Univ., Gainsville. Dept. of Environmental Engineering.
H. D. Putnam, W. H. Morgan, P. L. Brezonik, E. E. Shannon, and P. E. Maslin.
Copy available from GPO Sup Doc, $1.25; microfiche from NTIS as PB-209 863. Environmental Protection Agency Water Pollution Control Research Series, February 1972, 141 p, 36 tab, 40 fig, 87 ref. EPA Program 16010 DON 02/72.

Descriptors: *Eutrophication, *Mathematical models, *Essential nutrients, *Primary productivity, Water quality, Trophic level, Aquatic algae, Fish populations, Florida, Water pollution effects, Nitrogen, Phosphorus.
Identifiers: Anderson-Cue Lake, Melrose (Florida).

A small Florida lake has been receiving a regimen of nutrient addition equivalent to 500 mg/cu m-year N and 43 mg/cu m-year P since 1967. Data were accumulated through 1969. The effect on the lacustrine ecosystem of various biogenes includes production by primary producers, species diversity of plankton and certain production estimates at the secondary trophic level using natural populations of planktivorous fish. Plankton production using isotopic carbon is ca. 58 g/sq m-year. Species diversity is slowly changing to a mixed chlorophycean and yellow-green. Biomass of benthic green filamentous types has increased slightly. Nutrient addition has had little influence on zooplankton production. Related studies on 53 other regional lakes have been done using a multidimensional hybrid concept as defined by several trophic state indicators. This trophic state index has provided a means for ranking the lakes on an arbitrary scale. Cluster analysis utilizing pertinent characteristics resulted in classification of other lakes. Land use patterns and population characteristics were determined photographically and N and P budgets estimated. Using multiple regression and canonical analysis, several significant relationships were found between lake trophic state, lake basin, land use, and population characteristics. In general, trophic state of lakes can be expressed as a simple relationship incorporating N and P influx rates. (EPA abstract)
W72-08986

Ecole Nationale Superieure des Mines de Paris, Fontainebleau (France). Laboratoire d'-Hydrogeologie Mathematique.
For primary bibliographic entry see Field 06A.
W72-09076

DETERMINATION OF A NITROGEN--PHOSPHORUS BUDGET FOR BAYOU TEXAR, PENSACOLA, FLORIDA,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 05C.
W72-09087

ASPECTS OF PHOSPHORUS CYCLING IN BRACKISH WATERS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 05C.
W72-09090

RELATIONSHIP BETWEEN LIGHT CARBON DIOXIDE FIXATION AND DARK CARBON DIOXIDE FIXATION BY MARINE ALGAE,
Nova Univ., Dania, Fla. Physical Oceanographic Lab.
For primary bibliographic entry see Field 05C.
W72-09102

THE SEASONAL VARIATION OF DISSOLVED ORGANIC CARBON IN THE INSHORE WATERS OF THE MENAI STRAIT IN RELATION TO PRIMARY PRODUCTION,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 05A.
W72-09108

PATHWAYS OF ENERGY FLOW IN A SOUTH FLORIDA ESTUARY,
Miami Univ., Fla. Sea Grant Institutional Program.
W. E. Odum.
Available from the National Technical Information Service as COM-71-01066, $3.00 in paper copy, $0.95 in microfiche. Report No. NOAA-71092824; Sea Grant Technical Bulletin No. 7, January 1971. 175 p, 32 fig, 4 tab, 153 ref.

Descriptors: *Estuaries, Ecosystems, Aquatic populations, Trophic level, Florida, Mangrove swamps, Herbivores, Chemical properties, Physical properties, Carnivores, Omnivores, Predation, Productivity, Succession, Ecology, Biological communities, Food chains, Energy budget, Fish, Detritus, Dissolved solids, Leaves, Wetlands, Natural resources, Plant populations, Chemical analysis, Marshes, Salinity, Temperature, Sampling.
Identifiers: *Energy flow, Consumers, Macroinvertebrates, North River, Dissolved organic matter, Vascular plants, Sample preservation, Alpheus heterochelis, Penaeus duorarum, Rhithropanopeus, Harrisii, Taphromysis bowmani, Mysidiopsis almyra, Red mangrove, Rhizophora mangle, White mangrove, Laguncularia racemosa, Black mangrove, Avicennia nitida, Callinectes sapidus, Alligator mississipiensis, Cyclaspis varians.

The feeding habits of more than eighty species of animals were monitored from stomach content examinations of over 7,000 individuals made over a period of 10 months. From a consideration of these feeding habits on an annual basis, the organisms were classified as herbivores, omnivores, primary carnivores, middle carnivores, and higher carnivores. The principal source of food for the aquatic animal community of the Everglades mangrove belt is vascular plant detritus originating principally from red mangrove leaves. During the process of decay and microbial colonization, the detritus particles increase in relative protein content and in caloric value. There are at least four pathways by which freshly fallen mangrove leaves are utilized by heterotrophs: (A) dissolved organic substances to microorganisms to higher consumers, (B) dissolved organic substances to sorption on sediment and aged detritus particles to higher consumers, (C) leaf material to higher consumers, (D) leaf material to bacteria and fungi to higher consumers. The last pathway is believed to be the most important. There exists a key group of omnivorous estuarine organisms which ingest quantities of vascular plant detritus. In the North River estuary this key group of detritus consumers includes amphipods, mysids, cumaceans, ostracods, chironomid midge larvae, harpacticoid and planktonic copepods, snapping shrimp, caridean shrimp, penaeid shrimp, crabs, filter-feeding bivalves, and a few species of fishes. The omnivorous detritus consumers appear to obtain nutrition primarily from the microorganisms adsorbed upon detritus particles. The destruction of mangrove forests will remove a source of food input into an estuary and directly limit the production of detritus consumers and those predators which feed upon them. (Mackan-Battelle)
W72-09112

SELENIUM: RELATION TO DECREASED TOXICITY OF METHYLMERCURY ADDED TO DIETS CONTAINING TUNA,
Wisconsin Univ., Madison. Dept. of Nutritional Sciences.
For primary bibliographic entry see Field 05C.
W72-09117

A. DEGRADATION AND MINERALIZATION OF PETROLEUM BY TWO BACTERIA ISOLATED FROM COASTAL WATERS, B. DEGRADATION AND MINERALIZATION OF PETROLEUM IN SEA WATER: LIMITATION BY NITROGEN AND PHOSPHORUS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
For primary bibliographic entry see Field 05A.
W72-09121

DEPOSITION OF URANIUM IN THE SEDIMENT AND INTERSTITIAL WATER OF AN ANOXIC FJORD,
Hebrew Univ., Jerusalem (Israel). Dept. of Geology.
Y. Kolodny, and I. R. Kaplan.
Available from the National Technical Information Service as CONF-700 965-1, $3.00 in paper copy, $0.95 in microfiche. 1970. 43 p, 7 fig, 3 tab, 40 ref.

Descriptors: *Sediments, *Sea water, *Fjords, *Connate water, Uranium radioisotopes, Separation techniques, Rivers, Sampling, Oxidation, Spectroscopy, Distillation, Radioisotopes, Adsorption, Heavy metals, Radioactivity techniques, Water analysis.
Identifiers: *Uranium, Saanich Inlet, Complexing compounds, Authigenic uranium, Detrital uranium, Radioactive decay, British Columbia, Canada, Sample preservation, Sample preparation.

The behavior of uranium in sediments from an anoxic near-shore environment and in interstitial waters was investigated in samples collected at four stations in the Saanich Inlet, British Columbia. Uranium analysis included separation and plating as a thin source and subsequent decay analysis by alpha spectroscopy. Determination of isotopic ratios (indicators of separation efficiency) involved spectral interpretation; total uranium was determined by a U-232 tracer. Uranium was separated from acidifed, tracer-spiked interstitial water samples by coprecipitation with iron hydroxide. Three chemical fractionation methods were used to separate authigenic from detrital uranium in the sediments. Approximately half of the sediment uranium was organically complexed and the remainder was distributed as detrital minerals, authigenic tetravalent uranium, and uranium adsorbed on organic matter. That uranium is highly enriched in interstitial waters as compared to sea water seems to depend on the oxidation state and organic content of the sediment. Sediment concentration of uranium was found to be very efficient in this anoxic environment with the residence time of uranium in the water column being 3 or 4 times less than estimated for open oceans. (Jefferis-Battelle)
W72-09126

MASSIVE DEATHS OF FISH IN NATURAL RESERVOIRS CONTAMINATED WITH INDUSTRIAL WASTES, (IN POLISH),
Wyzsza Szkola Rolnicza, Wroclaw (Poland).
For primary bibliographic entry see Field 05C.
W72-09134

5C. Effects of Pollution

NITROGEN FIXATION BY BLUE-GREEN ALGAE IN YELLOWSTONE THERMAL AREAS,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
W. D. P. Stewart.
Phycologia, Vol 9, No 3-4, p 261-268, December 1970. 3 fig, 5 tab, 22 ref. NSF Grant GB-5258.

Descriptors: *Nitrogen fixation, *Algae, *Cyanophyta, *Thermal water, *Wyoming, National parks, Hot springs, Water temperatures, Nostoc streams, Data collections, Analytical techniques, Nitrogen fixing bacteria, Thermal pollution.
Identifiers: *Yellowstone National Park (Wyo), Blue-green algae, Mastigocladus, Calothrix.

Potential nitrogen-fixing blue-green algae were common in three hot spring streams in Yellowstone National Park. In two streams, where the dominant nitrogen-fixing algae were species of Calothrix, nitrogen fixation, as measured by uptake of N-15 was detected in situ in the temperature range 28-46 C. At higher temperatures nitrogen fixation was not detected, although the algae may have received fixed nitrogen from a growth of Calothrix, Nostoc, and unicellular algae which occurred at lower temperatures on the sides of the streams. In the third stream, where Mastigocladus was abundant, nitrogen fixation was detected at temperatures up to 54 C, although the optimum for fixation was near 42.5 C. The overall data imply that in situ nitrogen fixation contributes to the productivity of Yellowstone hot springs regions and that Mastigocladus and Calothrix are the most important nitrogen-fixing blue-green algae. (Woodard-USGS)
W72-08508

A STUDY OF ENVIRONMENTAL POLLUTION BY LEAD,
Illinois Univ., Urbana. Dept. of Engineering.
For primary bibliographic entry see Field 05B.
W72-08518

THE EFFECTS OF CHRONIC IRRADIATION BY TRITIATED WATER ON POECILIA RETICULATA, THE GUPPY,
Washington Univ., Seattle. Coll. of Fisheries.
R. C. Erickson.
Available from the National Technical Information Service as NVO-269-15, $3.00 in paper copy, $0.95 in microfiche. May 10, 1971. 27 p. AEC AT (26-1)-269.

Descriptors: *Radioactivity, *Radioactivity effects, *Fish, *Aquaria, *Fish behavior, Social behavior (Animals), Fish reproduction, Aquatic environment, Tritium, Environmental effects.
Identifiers: Tritiated water, Concentration.

Guppies were reared in tritiated water (HTO). The objectives were to characterize sublethal effects of chronic irradiation and to evaluate the effects of a range of HTO concentrations on the development and behavior of the guppy. Fish were exposed to HTO either throughout embryogenesis, average time 17 days, to concentrations of 0.025 to 0.50 mCi/ml, resulting in total doses of 90 to 2,500 rads, or at one week of age for periods of 21 to 30 days to concentrations of 0.05 to 1.0 mCi/ml, resulting in total doses of 350 to 4,700 rads. Significant effects were an increased proportion of males and an earlier appearance of male sec characteristics in fish exposed to the lowest HTO concentration used. (Houser-ORNL)
W72-08544

FLUX OF RADIONUCLIDES THROUGH A SALT MARSH ECOSYSTEM -- PROGRESS REPORT FOR JAN. 1, 1971 TO DEC. 30, 1971.
Georgia Univ., Athens. Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W72-08545

AN EVALUATION OF THE FACTORS INVOLVED IN BIO-ACCUMULATION OF GAMMA-EMITTING RADIONUCLIDES IN WHITE--TAILED DEER (ODOCOILEUS VIRGINIANUS) - 2/1/71 TO 1/31/72,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 05A.
W72-08546

BIOENVIRONMENTAL-EFFECTS PREDICTIONS FOR THE PROPOSED CANNIKIN UNDERGROUND NUCLEAR DETONATIONS AT AMCHITKA ISLAND, ALASKA,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
J. B. Kirkwood, and R. G. Fuller.
Available from the National Technical Information Service as BMI-171-141, $3.00 in paper copy, $0.95 in microfiche. October 1971. 31 p.

Descriptors: *Nuclear explosions, *Underground, *Seismic waves, Fallout, *Radioactivity, *Radioactivity effects, Hazards, Ecology, Environmental effects, Water pollution effects, Radioecology, Wildlife, Aquatic environment.
Identifiers: Radiation damage, Radiation effect, Amchitka Island, Plowshare Program.

The effects of the Cannikin test on the environment and biota in the terrestrial, freshwater, and marine ecosystems of Amchitka Island are predicted to be of somewhat greater magnitude than the effects of project Milrow. However, no plant or animal population is expected to be endangered. These predictions are based on the assumption that the Cannikin detonation will occur in the autumn, and that predictions of ground shock and underwater pressure changes supplied by AEC Nevada Operations Office are essentially correct. (Houser-ORNL)
W72-08552

NUCLEAR CRATERING EXPLOSION EFFECTS FOR INTEROCEANIC CANAL FEASIBILITY STUDIES.
Nevada Operations Office (AEC), Las Vegas.
For primary bibliographic entry see Field 05B.
W72-08553

THE AGE AND GROWTH OF THE LARGEMOUTH BASS MICROPTERUS SALMOIDES (LACEPEDE), IN A THERMALLY LOADED RESERVOIR,
Missouri Univ., Columbia. Graduate School.
G. P. Busacker.
MA thesis, August 1971. 102 p. 12 fig, 13 tab, 54 ref, 3 append. OWRR A-020-MO (2).

Descriptors: *Bass, *Fish, *Growth rates, *Thermal pollution, Reservoirs, Age, Water temperature, Turbidity, Reproduction, Food habits, Acclimatization, Metabolism, Fishing, Length, Weight, *Missouri.
Identifiers: *Micropterus salmoides, *Thomas Hill Reservoir (Mo).

From July 1969 to June 1970 heated water discharge from a fossil fuel plant into Thomas Hill Reservoir, Missouri was investigated to determine effect on growth of largemouth bass (Micropterus salmoides). Thr reservoir (4500 acres) has two arms of almost equal size. Maximum discharge temperature was 37C. Hotwater Arm temperature was elevated 0.5 to 11.5C above the control. The reservoir, formed in 1966, was clear the first three years, but became highly turbid in 1969 and 1970. The heated water had no adverse effect on water quality except to elevate temperature. The minimum winter temperature in the Hotwater Arm was 10.0C. No differences were found between the body-scale and length-weight relationships of bass from the two Arms. Condition factors did not differ from bass from the Hotwater or Control Arms. The heated water affected the bass by annulus formation up to one month earlier in Hotwater Arm than in control; extending growing season and producing greater annual growth increment; causing bass to congregate in Hotwater Arm in winter (providing excellent fishing). The heated water discharge had no apparent deleterious effects on adult largemouth bass during the study. (Jones-Wisconsin)
W72-08558

A KINETIC MODEL OF PHYTOPLANKTON GROWTH, AND ITS USE IN ALGAL CONTROL BY RESERVOIR MIXING,
Municipal Waterworks of Rotterdam (Netherlands).
F. Oskam.
Presented at International Symposium on Manmade Lakes, Their Problems and Environmental Effects, Knoxville, Tennessee, May 3-7, 1971. 21 p, 5 fig, 36 ref.

Descriptors: *Phytoplankton, *Mathematical models, *Algal control, *Reservoirs, Destratification, Mixing, Phosphorus, Nitrogen, Turbulence, Photosynthesis, Depth, Light pentration, Respriation, Nutrients, Turbidity, Productivity, Plankton, Standing crop, Limnology, Eutrophication.
Identifiers: Rhine River (The Netherlands), Meuse River (The Netherlands), Biesbosch Reservoir (The Netherlands), Kinetic equation.

An in-reservoir method of algal control by turbulent mixing is considered. Based on the conclusion that light is the basic controller of plankton development and by considering net growth as the balance between gross photosynthesis and respiration, a simplified mathematical expression was developed for the relation between water transparency, light pentration, and mixing depth. A mixed layer of about 20 m might severly restrict algal growth at high levels of natural turbidity, whereas productivity in a clear water reservoir would hardly be affected. In the latter case nutrient limitation can be expected to be operative long before light would become limiting. This explains the fact that until recently the connection between turbulence and algal growth has been neglected in limnological studies. Deepening the mixed layer may also be at least partly responsible for the decrease in standing crop, observed in several destratification experiments. An even distribution of algae is an essential requirement for the model to be valid. Maintaining a homogeneous state asks for a continuous level of turbulence, which must be introduced artificially. The conditions for prarctical realization of effective turbulent mixing have to be established before the reliability of algal control by this method can be ascertained. (Auen-Wisconsin)
W72-08559

ALGAL POPULATIONS IN MOSES LAKE, WASHINGTON: TEMPORAL AND SPATIAL DISTRIBUTION AND RELATIONSHIP WITH ENVIRONMENTAL PARAMETERS,
Washington Univ., Seattle.
R. M. Bush.
MS thesis, 1971. 113 p. 9 fig, 2 plates, 8 tab, 35 ref, 2 append. OWRR A-034-WASH (2).

Descriptors: *Algae, *Population, *Temporal distribution, *Spatial distribution, Environment, Sampling, Chemical analysis, Plankton, Computer programs, Biomass, Temperature, Conductivity, Phosphates, Nitrates, Alkalinity, Diatoms, Cyanophyta, Chlorophyta, Seasonal, Nutrients, Thermal stratification, Carbon, Sediments, Carbon dioxide, Chlorphyll, Domestic wastes, Eutrophication, Turbidity, Seston, Hydrogen ion concentration, Scenedesmus, Dinoflagellates, Chrysophyta, Protozoa, *Washington.
Identifiers: *Moses Lake (Wash).

Naturally occurring algal populations in Moses Lake, Washington were studied relative to environmental parameters influencing growth and distribution, especially those limiting or causing nuisance growths. Using cluster analysis, the different algal populations were delineated from plankton samples collected over two years. Samples were grouped on the basis of high joint occurrences of algal species. The three most prevalent populations were (1) composed predominantly of diatom genera and often dominated diatoms, (2) dominated by blue-green algee, and (3) composed predominatly of green algae and dominated by green algae. Algal populations 1 and 3 were found consistently in specific lake areas and demonstrated little temporal variation. The remaining lake areas followed a successional pattern in algal populations resulting in one dominated by blue-green algae in the summer. Multiple regression analysis indicated that orthphosphate and conductivity best explained the variation in blue-green population biomass. This occurred despite the fact that nitrogen seemed to be the limiting nutrient. As

with the blue-green algal population, the green algal biomass was correlated negatively with conductivity and phosphate-phosphorus indicating and uptake of phosphate-phosphorus and dissolved salts (represented by conductivity) as the biomass increased. (Jones-Wisconsin)
W72-08560

THE ROLE AND PROBLEMS OF PATHOLOGICAL ANATOMY IN ICHTHYOTOXICOLOGY,
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Saratov (USSR).
N. D. Mazmanidi.
Available from the National Technical Information Service as PB-203 807T, $3.00 in paper copy, $0.95 in microfiche. Bureau of Sport Fisheries and Wildlife Translation, August 1971. 9 p. 25 ref. Trans. of Rol i zadachi patold-gicheskoi anatomii i ikhtiotoksiicologii.

Descriptors: *Water pollution effects, *Fish, *Pathology, Fish diseases, Toxins, Analytical techniques, Industrial wastes, Lethal limit.
Identifiers: *Aquatic toxicology, *Pathomorphology, USSR.

The principal task of aquatic toxicology--the determination of the maximum permissible concentrations or doses of different chemical substances in fishery waters--can be resolved successfully on the basis of methodology involving fecundity determination and offspring quality. The problem of control of toxic products in a body of water depends largely on well developed pathomorphological diagnosis of fish poisonings. Histological investigations must be compulsory. The causes of fish mortality in the Kamo and Sura basins of the Volga delta differ substantially. Pop-eye, ascites, general dropsy of the body, disheveling of the scales, and ulcerous diseases of the oral cavity and intestine have been observed. Pop-eye and various dystrophic changes in the central nervous system, liver and kidneys were established in poisonings with elemental phosphorus. With oxygen deficit, different shifts involving the vascular systems and organs of hemopoiesis are characteristic. To protect inland waters from pollution, legal measures must be used to control intake from industrial enterprises. The ministry should establish the necessary maximum permissible concentration of pollutants. A laboratory of Aquatic Toxicology should be organized including divisions of toxicology, analytical chemistry, pathological anatomy and forensic-ichthyological expertise, biochemistry and pathophysiology. (Jones-Wisconsin)
W72-08561

PECULIARITIES OF THE ACTION OF POLLUTANTS ON A POPULATION OF AQUATIC ORGANISMS,
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
L. A. Lesnikov.
Available from the National Technical Information Service as PB-203 806T, $3.00 in paper copy, $0.95 in microfiche. Bureau of Sport Fisheries and Wildlife, Translation, July 1971. 7 p. 4 ref. Trans. of Osobennosti deistviya zagryaznenii na populyatsii vodnykh organizmov.

Descriptors: *Water pollution effects, *Fish populations, Biorthythms, Fish reproduction, Salmonides, Larvae, Spawning, Daphnia.
Identifiers: Primary effects, Secondary effects.

Pollution effects on productivity of commercial fish species is discussed and factors subdivided according to effect on population productive properties. Three basic types of direct pollutant action can be isolated: Pollution can cause death of a portion of individuals in a population in which case compensatory increase in population growth rate occurs up to a specific degree but does not compensate entirely and the population abundance gradually decreases. Secondly, pollution affects the overall condition of the organisms (metabolism, etc), reduction occurring in the range of variation of individuals, as well as decrease in the difference between maximal, physiologically optimal abundance and saturation abundance. Thirdly, pollutants disturb processes of oogenesis and embryogenesis or cause spawning of poor-quality or non-viable offspring. In conducting experiments on populations for establishment of maximum permissable concentration (MPC) of substances which exert an action of the first and second type, the principal indices by which one can reliably dtermine the MPC are increase of the biomass, abundance of young, and increase of individuals; however, these indices will be inadequate for substances which exert an action of the third type. (Jones-Wisconsin)
W72-08562

THE STUDY OF INFECTIOUS FISH DISEASES IN THE USSR,
O. N. Bauer.
Available from the National Technical Information Service as PB-203 803T, $3.00 in paper copy, $0.95 in microfiche. va (USSR). In: Izvestiya Gosudarstvennogo Nauchno-Issledovatel'skogo Instituta Ozernogo i Rechnogo Rybnogo Khozyaistva. Vol 69, p 5-12, 1969. Bureau of Sport Fisheries and Wildlife, Translation, October 1971. 15 p, 62 ref. Trans. of Izucheniye infektsionnyich zabolevanii ryb v SSSR.

Descriptors: *Infection, *Fish, *Diseases, Carp, Viruses, Pikes, Perches.
Identifiers: *USSR, Red rot, Swimbladder inflammation, Branchiomycosis.

History of fish infectious disease studies in the USSR is outlined. Publications on saprolegnioses, tumors of pikeperch, pike plague and certain nonparasitic diseases appeared in the early 30's. The epizootological aspects of carp red rot were published. Clarification of red rot etiology gave new evidence of its viral nature. Presence of interaplasmic inclusions in the glia of the brain and the possibility of obtaining active artificial immunity were demonstrated. Use of tissue cultures of red rot was developed and a report published on artificial infection of carp by the agent of red rot reared on this culture. On the basis of analysis of epizootologica data, outbreaks of branchiomycosis were observed at the hottest time of the year in ponds with elevated oxidizability. The use of antibiotics in pond pisciculture gave results showing that intra-dominal injection of antibiotics can be employed on a limited scale. A method of degumming carp spawn with testicular hyaluronidase to obtain sterile offspring from diseased fish was successfully realized. Work has continued on red rot and a new disease called swimbladder inflammation of the carp studied. (Jones-Wisconsin)
W72-08563

WATER QUANTITY AND QUALITY STUDIES OF VANCOUVER LAKE, WASHINGTON,
Washington State Univ., Pullman. Sanitary Engineering Section; and Washington State Univ., Pullman. Hydraulic Section.
Surinder K. Bhagat, and John F. Orsborn.
Summary report, September 1971. 35 p. 15 fig, 41 ref. EPA 16080 ERP. 16080 ERQ.

Descriptors: *Water quality, *Lakes, *Rehabilitation, Hydrology, Hydrography, Model studies, Septic tanks, Dredging, Water pollution sources, Water management (Applied), Flow augmentation, Eutrophication, Waste dilution, Social participation, Measurement, Precipitation (Atmospheric), Water quality standards, Water supply development, Forecasting, Water pollution control, Economic impact, Recreation, Project planning, Benefits, Planning.
Identifiers: *Vancouver Lake (Wash), Flushing.

Although Vancouver Lake, Washington is a dying lake it has the potential of a valuable water resource due particularly to its location near the Columbia River which can be used as a source of 'flushing' water. The interrelated features of the Vancouver Lake-Columbia River lake system were investigated by hydrologic, hydrographic, hydraulic modeling, and water quality prediction studies. There are three interrelated steps which can be taken to improve the water quantity and quality of Vancouver Lake: curtail the sources and amounts of pollutants entering the lake, dredge the lake to remove bottom muds and increase its depth, and introduce an additional flow of water to improve and maintain its quality. To curtail pollution, programs for sewer installation and limitation on septic tank use will reduce the human waste pollution load. Although the contaminated groundwater flow will continue for some time until natural processes dilute and degrade the existing waste load, drainage from livestock areas should be controlled. Flow of fertilizers from fields and lawns upstream, especially during periods of intense rainfall and surface runoff will continue but sediment loads can be reduced. 32 organizations and individuals contributed to these Vancouver Lakes studies. (Jones-Wisconsin)
W72-08564

NUTRIENT LOSSES FROM AGRICULTURAL LAND,
Imperial Chemical Industries Ltd., Jealott's Hill (England). Jealott's Hill Research Station.
T. E. Tomlinson.
Outlook on Agriculture, Vol 6, No 6, p 272-278, 1971. 2 fig, 8 tab 19 ref.

Descriptors: *Eutrophication, *Agricultural runoff, Fertilizers, Nitrates, Percolation, Farm wastes, Drainage water, Feed lots, Nitrogen, Phosphorus, Potassium, Rivers, Leaching, Soil erosion.
Identifiers: Britain.

Considering problems of eutrophication and high nitrate levels specifically toxic to infants, a review was made of known nutrient losses from agricultural land and how these relate to farming, especially in England. Nutrients are lost from farmland by drainage water percolating through the soil leaching soluble plant nutrients, by inefficient return of livestock excreta to the land, and by erosion of surface soils or movement of fine soil particles into subsoil drainage systems. Lysimeter studies indicate that the nature of the cropping greatly influences loss of nitrate in drainage and confirm the possibility of large losses from soil reserves in certain circumstances. Many soils contain large reserves of nitrogen which can be released as nitrate over long periods of time, even if the soils are not cropped or fertilized. Phosphate levels of drainage water from soils are low, as illustrated by lysimeter studies. There is little danger that a large proportion of potassium fertilizer application will be lost in drainage. It is concluded that, at the present time, there do not seem to be grounds for serious concern about a general nitrate level rise in English rivers. (Jones-Wisconsin)
W72-08565

ADAPTIVE LEAF ARCHITECTURE IN EMERGENT AND FLOATING SPARGANIUM,
Nebraska Univ., Lincoln. Dept. of Botany.
Robert B. Kaul.
American Journal of Botany, Vol 59, No 3, p 270-278, 1972. 13 fig, 15 ref.

Descriptors: *Aquatic plants, *Leaves, *Structure, Floating plants, Photosynthesis, Chlorophyll, Systematics, Minnesota, Submerged plants.
Identifiers: *Emergent leaves, Sparganium eurycarpum, Sparganium americanum, Sparganium fluctuans, Sparganium minimum.

That aquatic angiosperms are derived from terrestrial forms is evident. Sparganium shows degrees of adaptation, some species being emergent and others floating (but rooted), WHILE

SOME LIVE SUBMERGED IN RUNNING WATER. The robust emergent leaves of Sparganium eurycarpum and S americanum are supported by corner fiber masses and large bundle sheaths, but the thin floating leaves of S fluctuans and S minimum have only moderate bundle sheaths. In emergent types heavily photosynthetic diaphragms bearing vascular bundles are separated from each other in the leaf compartments by three lightly photosynthetic diaphragms without bundles, but in floating types only every other heavily photosynthetic diaphragm has a bundle. Palisade chlorenchyma occurs only at aerial surfaces--abaxial and adaxial in emergent leaves but only adaxial in floating leaves. Extra photosynthetic areas are provided in emergent leaves by concentrations of chlorenchyma in limited areas on interior partitioning walls, while the remainder of the walls is translucent. Since only 25% of the diaphragms are heavily photosynthetic, and the others essentially transparent because of diffusely distributed chloroplasts and large intercellular spaces, a sieve effect exists allowing even the interior parts of thick emergent leaves to photosynthesize. (Jones-Wisconsin)
W72-08566

ORGANIC-CARBON BUDGET OF THE BLACK SEA,
Woods Hole Oceanographic Institution, Mass. Dept. of Chemistry.
W. G. Deuser.
Deep-Sea Research, Vol 18, p 995-1004, 1971. 2 fig, 1 tab, 26 ref.

Descriptors: *Organic matter, *Carbon, *Carbon cycle, Sediments, Anaerobic conditions, Primary productivity, Photosynthesis, Chemistry, Synthesis, Oceans, Carbon dioxide, Oxidation, Respriation, Reduction (Chemical), Degradation (Decomposition), Volatility, Sedimentation, Depth.
Identifiers: *Organic carbon budget, *Black Sea.

Formation and degradation of organic matter in the Black Sea, an anoxic basin, was studied. Fluxes derived from direct measurements are primary production, organic matter input from rivers and Azov and Marmara Seas, organic matter oxidation during bacterial sulfate reduction in the anoxic zone, organic matter solubilization at depth, and permanent organic carbon fixation in sediments. Fluxes obtained from mass balance calculations are the particulate flux into the anoxic zone, respiration or total oxidation of organic carbon in aerated waters, and an upper limit to chemosynthesis. Assuming that the Black Sea organic carbon budget has been close to a steady state during the last 2000 years and based on new measurements the organic-carbon budget has been assessed. Between 80 and 95% of organic-carbon input near the surface is recycled in the top 200 meters; no more than 4% of the input is permanently fixed in the sediment in spite of the oxygen balance below 200 meters; at least four-fifths of organic matter entering the anoxic waters are oxidized or rendered soluble; an upper limit to truly primary production through chemosynthesis is 15 gC/sq m per year or about 15% of the amount of photosynthetic production. (Jones-Wisconsin)
W72-08567

AN INTERIM STUDY OF SOME PHYSICAL, CHEMICAL AND BIOLOGICAL PROPERTIES OF SELECTED OREGON LAKES,
Oregon State Dept. of Environmental Quality, Portland.
R. A. McHugh.
January 1972. 233 p. 14 tab, 232 ref.

Descriptors: *Water quality, *Oregon, *Lakes, *Physicochemical properties, *Trophic level, *Biological properties, Irrigation, Industrial water, Potable water, Water quality control, Regulation, Zoning, Water pollution control, Eutrophication, Recreation, Recreation facilities, Boating, Recreation wastes, Monitoring, Public health, Chemical analysis, Coliforms, Streptococcus, Salmonella.
Identifiers: *Remedial measures.

This report makes available information regarding water quality and trophic levels of those Oregon lakes and reservoirs which have been studied by the Department of Environmental Quality and incorporates data from other sources. Bacteriological testing is done periodically to ensure safety for swimming and boating. Basic chemical analyses are made to detect pollution from wastes or deleterious runoff. The trophic level of each lake and reservoir is determined by chemical and biological means to detect any unfavorable trend. In certain cases, chemical analyses are made to determine suitability of lake water for irrigation, industrial water supply, and municipal water supplies. The lakes are classified biologically and some typed according to dominant species. The natural sources of nutrients are studied. The indicator organisms present at each collecting station are listed and grouped into large categories, such as Diatoms, Desmids, Rotifers, and Cladocera. The lakes and reservoirs are classified under Coastal Lakes, Oxbow Lakes, Cascade Range Lakes, Eastern Oregon Reservoirs, Snake River Reservoirs, and Miscellaneous Lakes, with detailed notes on each individual lake and reservoir. Measures to prevent eutrophication and remedial measures for lakes already affected by eutrophication are described. (Jones-Wisconsin)
W72-08568

A PRELIMINARY SURVEY OF THE BENTHIC MACROFAUNA AND SEDIMENTS IN LOCHS ETIVE AND CRERAN, SEA-LOCHS ALONG THE WEST COAST OF SCOTLAND,
Dunstaffnage Marine Research Lab., Oban (Scotland).
J. Gage.
Journal of the Marine Biological Association of the United Kingdom, Vol 52, p 237-276, 1972. 8 fig, 2 tab, 27 ref.

Descriptors: *Benthic fauna, *Sediments, *Estuaries, Surveys, Hydrography, Marine animals, Benthos, Brackish water, Tidal waters, Mathematical studies, Mollusks, Worms, Biological communities.
Identifiers: *Macrofauna, *Loch Etive (Scotland), *Loch Creran (Scotland).

This benthos survey was undertaken primarily for preliminary, comparative data on infaunal populations in Loch Etive and Loch Creran, Scotland. Seasonal changes in temperature and salinity in Loch Etive follow roughly local coastal pattern but usually with a timing lag probably due to restricting effect of the twin sills. In contrast, Loch Creran has a small catchment and the hydrography closely follows the outside pattern. The bottom fauna of both lochs was sampled semi-quantitatively. A detailed list of the fully marine fauna is given and species occurrences are compared. An attempt was made to relate the groupings to the classical 'bottom community' concept, the feeding-type categories, and to sediment particle size; a correlation to sediment type was apparent. Survey of the infauna of the intertidal areas revealed marked differences between the two lochs. In Loch Etive, a limited number of typically brackish-water species occurred uniformly in the intertidal and shallow subtidal sediments, none of these species occurring in samples from deeper water, which may be due to the considerable influx of freshwater runoff. In Loch Creran, many of the species found intertidally had occurred in the dredgings and only in the small inner basin did brackish species occur exclusively. For a similar bottom habitat, the fauna in Loch Etive was considered to be slightly less diverse compared to Loch Creran. (Jones-Wisconsin)
W72-08572

SEWAGE FUNGUS IN RIVERS IN THE UNITED KINGDOM: THE SLIME COMMUNITY AND ITS CONSTITUENT ORGANISMS,
Water Pollution Research Lab., Stevenage (England).
E. J. C. Curtis, and C. R. Curds.
Water Research, Vol 5, p 1147-1159, 1971. 3 fig, 4 tab, 27 ref.

Descriptors: *Sewage, *Fungi, *Slime, *Biological communities, Rivers, Bacteria, Water pollution, Activated sludge, Algae, Protozoa, Diatoms, Euglena, Mathematical studies.
Identifiers: *United Kingdom, *Sewage fungus, Sphaerototilus natans, Zoogloeal bacteria.

Biological composition of slimes examined during a survey of slime outbreaks in the United Kingdom is described and compared with other polluted water biota. Slimes were frequently dominated by Sphaerotilus natans or zoogloeal bacteria, and the interrelationships of these and other species were studied using cluster analysis and diversity indices. Compared with S natans and zoogloeal forms, all other organisms contributing to the actual slime matrix occurred only infrequently. The most common to occur as dominant organisms were the fungi, Leptomitus lacteus and Geotrichum candidum occurring in large amounts in 3.4 and 4.5% of sites respectively, and the gliding bacterium Beggiatoa alba (5.6%). Other filamentous organisms were more widely found as minor components of slimes formed primarily by S natans or zoogloeal bacteria. Filaments of Flexibacterium and Flavobacterium were sometimes attached to filaments of S natans or other material without specific holdfast. Filamentous algae only rarely occurred in sewage fungus slimes. Most samples contained protozoa and all ciliated protozoa. Seventy-seven ciliate species were recorded. In addition to cluster analysis, another technique describing association between organisms and groups of organisms is construction of a minimum-spanning tree. (Jones-Wisconsin)
W72-08573

MATHEMATICAL MODELING OF NUTRIENT--TRANSPORT,
Massachusetts Univ., Amherst. Water Resources Research Center.
F. A. DiGiano.
Publication No 17, 1971. 37 p, 12 fig, 6 ref. OWRR B-005-MASS (3).

Descriptors: *Cycling nutrients, *Mathematical models, *Nutrients, Adsorption, Diffusion, Interfaces, Mass transfer, Boundary processes, Eutrophication.
Identifiers: *Nutrient transport, Nutrient release, Nutrient interchange.

Relevant to dredging operations and in situ treatment of bottom deposits directed toward controlling or possibly eliminating the deposit as a nutrient-supply source and toward excessive algae and other planktonic growth control, mathematical modeling of the transport phenomena was attempted to determine and possibly manipulate extent and depth from which the deposit releases nutrients and alters the nutrient equilibrium concentration in overlying water. Biological and biochemical effects on the transport process was minimized by sterilizing the deposit. Methods of sterilizing a deposit sample and maintaining a laboratory deposit-water system were developed. Parallel sets of experiments of 'sterilized' and 'non-sterilized' (or 'natural') deposit-water systems were conducted simultaneously. The types of physical mass transfer models investigated were: Model 1,-Pore diffusion through interstitial water of deposit; Model 2,-Interfacial transport (water-deposit interface); Model 3,-Diffusion with simultaneous adsorption; Model 4,-Nutrient release via diffusion. A conceptual sketch of apparatus for testing Models 1 through 3 is given. Although quantitative description of adsorption isotherm was not attempted, oxidation-reduction potential was shown to have a strong influence on phosphate movement direction in the water-deposit system. These studies should lead to formulation of optimum corrective measures. (Jones-Wisconsin)
W72-08574

THE FLUX OF PARTICULATE CARBON IN AN ESTUARY,
Maryland Dept. of Research and Education, Solomons. Chesapeake Biological Lab.
R. B. Biggs, and D. A. Flemer.
Marine Biology, Vol 12, No 1, p 11-17, 1972. 3 fig, 1 tab, 14 ref.

Descriptors: *Estuaries, *Carbon, *Fluctuation, Spatial distribution, Carbon cycle, Sinks, Drainage, Primary productivity, Benthos, Respiration, Photosynthesis, Distribution, Circulation, Sediments.
Identifiers: *Particulate organic carbon, *Chesapeake Bay, Particulate carbon sources, Organic carbon.

Northern Chesapeake Bay, divided into two sections, was studied relative to sources and sinks of organic carbon as determined by a generalized model. The section from the head of the bay to the vicinity of Baltimore was characterized by a high input of particulate carbon from upland drainage. The section from Baltimore to the mouth of the Potomac River was dominated by an internal supply of particulate carbon from primary production. The northernmost section was characterized by major particulate carbon losses to the bottom and to benthic respiration, with slightly less than half of the particulate carbon respired in the water column or converted to dissolved organic matter. In contrast, respiration in the water column or conversion to dissolved organic matter was responsible for loss of about 65% of the particulate carbon in the middle section of the bay, while losses to the bottom and to benthic respiration totaled only 12%. Even though the supply of particulate carbon to the upper bay was about 1.5 times the supply to the middle bay, loss of carbon due to biological activity in each area was similar, and amounted to about 70% of the particulate carbon supply. (Jones-Wisconsin)
W72-08575

RESPONSE OF AQUATIC PLANTS TO COMBINATIONS OF ENDOTHALL AND COPPER,
Florida Univ., Gainesville. Dept. of Agronomy; and Florida Univ., Fort Lauderdale. Agricultural Research Center.
D. L. Sutton, R. D. Blackburn, and W. C. Barlowe.
Weed Science, Vol 19, Issue 6, p 643-646, 1971. 6 tab, 19 ref.

Descriptors: *Aquatic weed control, *Herbicides, *Copper compounds, Phytotoxicity, Diquat, Transpiration, Plant growth regulators.
Identifiers: *Endothall, Parrotfeather, Myriophyllum brasiliense, Hydrilla verticillata, Copper sulfate pentahydrate.

Herbicide combinations may be more effective than individual chemicals for control of aquatic vegetation in some situations. A combination that could control aquatic vegetation at concentrations lower than that required for individual compounds might reduce residue levels in the aquatic environment. A combination may control a broad spectrum of plants or some combinations might be selective. Responses of two aquatic plants to the combination of endothall and copper sulfate pentahydrate (CSP) are examined. Addition of 0.5 and 5.0 ppmw of 7-oxabicyclo (2.2.1) = heptane-2,3-dicarboxylic acid (endothall) to solutions of CSP at 1.0 ppmw of copper applied to the roots of emersed parrotfeather (Myriophyllum brasiliense) increased the copper content of the roots of these plants. Growth of parrotfeather was inhibited by root applications of 0.5 and 5.0 ppmw endothall, but CSP did not increase its phytotoxicity. A synergistic effect, as determined by dry weight, was calculated after treatment of hydrilla (Hydrilla verticillata) with a combination of 5.0 ppmw of endothall plus CSP at 1.0 ppmw copper. An increase in copper uptake and a reduction in phosphorus levels was associated with those plants treated with the combination. (Jones-Wisconsin)
W72-08577

A SIMPLE APPARATUS FOR DELIVERING A HEAT SHOCK TO MICROSCOPIC AQUATIC ORGANISMS,
Virginia Polytechnic Inst., Blacksburg. Dept. of Biology.
E. D. Lorton, and J. Cairns, Jr.
Revista de Biologia, Vol 7, No 3-4, p 229-237, 1971. 2 fig, 5 tab. OWRR B-017-VA (4).

Descriptors: *Instrumentation, *Aquatic microorganisms, *Thermal shock, Measurement, Protozoa.
Identifiers: *Heat shock.

Considering the anticipated power demands and the resulting thermal pollution, additional information on response of microscopic aquatic organisms to acute thermal stress prompted development of the apparatus which permits continued observation of the microorganism responses to acute thermal shock. The apparatus is capable of heating water containing test organisms quickly as well as maintaining nearly constant temperature. It consists of a test cell constructed of acrylic plastic with a small resistance heater controlled by a variable transformer capable of delivering a heat shock to aquatic organisms while they were being observed through a microscope. Microthermocouples were used to measure the temperature of the fluid in the cell. Response to rapid increase in temperature was determined for the protozoans Euglena gracilis, Spirostomum ambiguum, Colpidium colpoda, Stentor coeruleus, Tetrahymena pyriformis, and Paramecium multimicronucleatum. Response to several constant temperatures was determined for E gracilis, S ambiguum, and C colpoda. The apparatus may also be suitable for use with a variety of small aquatic organisms in addition to protozoans. The principal advantages of this apparatus are the small quantity of test fluid required and the provision for observing microscopic organisms under thermal stress. (Jones-Wisconsin)
W72-08578

POLLUTION CONTROLLED CHANGES IN ALGAL AND PROTOZOAN COMMUNITIES,
Virginia Polytechnic Inst., Blacksburg. Center for Environmental Studies; and Virginia Polytechnic Inst., Blacksburg. Dept. of Biology.
J. Cairns, Jr., and G. R. Lanza.
In: Water Pollution Microbiology, p 245-272. John Wiley and Sons, Inc, New York, 1972. OWRR B-017-VA (5).

Descriptors: *Aquatic microorganisms, *Water pollution effects, *Algae, *Protozoa, *Biological communities, Ecological distribution, Bioindicators, Water pollution sources.
Identifiers: Ridley Creek (Pa), Lititz Creek (Pa), Species diversity, Direct effects, Indirect effects.

Stresses caused by wastes affect algal and protozoan communities by reduction in species number, increase in range of numbers of individuals per species, reduction in colonization rates, changes in selective predator or parasite pressure, and shift in dominance within the community. A rather simple response pattern to stress is characteristic of both populations and communities and may be used to assess the stress effect. Algal and protozoan species frequently have complex requirements that may rival those of higher organisms. It is becoming increasingly evident that the same ecological principles applicable to higher plants and animals are also valid for algae and protozoa. Microbial communities have a structure which is maintained despite succession; other homeostatic mechanisms are also operative. General effects of stress caused by industrial and municipal wastes and agricultural runoff are discussed. The basic categories of pollution are: nontoxic organic and inorganic substances, thermal changes, toxic substances, suspended solids, and radioactive materials. With a finite ecological base and increased pressures on this base, standards must be developed to protect the system and knowledge of its operational prerequisites must be gained to manage it well. (Jones-Wisconsin)
W72-08579

HISTOCHEMICAL AND CYTOPHOTOMETRIC ASSAY OF ACID STRESS IN FRESHWATER FISH,
Pennsylvania State Univ., University Park. Dept. of Biology.
A. Anthony, E. L. Cooper, R. B. Mitchell, W. H. Neff, and C. D. Therrien.
Environmental Protection Agency, Water Pollution Control Research Series 18050 DXJ, May 1971. 113 p, 32 fig, 18 tab, 66 ref, appendix.

Descriptors: *Bioindicators, *Animal pathology, *Bioassay, *Acids, *Fish, Fresh water, Cytological studies, Water pollution effects, Acidic water, Fish physiology, Toxins, Brook trout, Hydrogen ion concentration, Heavy metals, Analytical techniques, Microscopy.
Identifiers: *Histochemistry, Histopathology, Liver.

Cytophotometry as a bioassay approach enables detection of fish tissue changes as water pollution indicators. Data on hemal, endoctrine, and excretory tissue parameters are especially significant. Feasibility of using histochemical and histopathological changes in brook trout, longnose dace and fathead minnows as bioindicators of acid pollution was investigated. A gravity flow diluter system was used in laboratory studies and net traps in field studies during sublethal exposures of 4-5 and 28-30 days. Histochemical and cytophotometric analyses were made of gills, Stannius corpuscle, blood, spleen, kidney and liver. Acid toxicant action is primarily gill damage resulting in impaired respiratory, excretory and liver functions. Short term indices of acid stress include colloidal iron and PAS staining of gills and renal Stannius corpuscles. Prolonged acid exposure is indicated by decreased azure B-RNA staining of liver cells, assessing the extent of liver impairment and reflecting a reduced tolerance of fish to other toxicants. Sublethal levels of acidity are not cumulative. Levels of about pH 5.0 are considered hazardous, proving toxic to breeding fish having increased oxygen needs, and reducing the liver's ability to detoxify noxious substances present in acid polluted waters. (Jones-Wisconsin)
W72-08581

THE RECOVERY OF DAMAGED STREAMS,
Virginia Polytechnic Inst., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst., Blacksburg. Center for Environmental Studies.
J. Cairns, Jr., J. S. Crossman, K. L. Dickson, and E. E. Herricks.
Association of Southeastern Biologists Bulletin, Vol 18, No 3, p 79-106, 1971. 20 fig, 8 tab, 26 ref. OWRR B-034-VA (2).

Descriptors: *Streams, *Water pollution effects, *Biological communities, Reclamation, Water quality, Ecological distribution, Acid mine water, Water pollution control, Hydrogen ion concentration, Toxicity, Mine drainage, Ecosystems, Virginia, Pennsylvania, Tennessee, Fly ash, Benthic fauna.
Identifiers: *Recolonization, *Biological recovery, Ethyl benzene-creosote spill, *Roanoke River (Va), *Youghigheny River (Pa), *Little Scrubgrass Creek (Pa), *Clinch River (Va).

History studies of the response of complex aquatic communities to acute pollutional stress and the natural recovery processes are described. Short term acute stresses produced by release of acidic or caustic materials into a stream elicit response in macroinvertebrate and fish communities typified by immediate reduction in specimen number. When no residual toxicity is found and there are undamaged areas available for recolonizing organisms, a rapid recovery may be expected. Mill Creek, tributary to Roanoke River, Virginia had such recovery. Biological recovery of the Clinch River from acute pH stresses has been slower due to severity and extent of biological damage. Long term acute stress from materials with residual toxicities produce a similar but slightly different response, with immediate reduction in diversity and density. With residual toxicities the macroin-

vertebrate organisms that survive seem to establish an interim community structure lasting while toxicity persists. Roanoke River had a residual toxicity from an ethyl benzene–creosote spill which has combined with a sedimentation problem and resulted in an atypical benthic community. There were no caddis flies, riffle beetles, or crayfish. Macroinvertebrate community found under continuous acid stress in Indian Creek was also atypical. (Jones-Wisconsin)
W72-08582

RELATIONSHIPS OF AUTOTROPHIC AMMONIUM-OXIDIZING BACTERIA TO MARINE SALTS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Sciences.
M. S. Finstein, and Margaret R. Bitzky.
Water Research, Vol 6, p 31-40, 1972. 6 fig, 2 tab, 12 ref.

Descriptors: *Aquatic bacteria, *Salts, *Sea water, Ammonification, *Nitrification, Fresh water, Estuaries, Salinity, Laboratory tests, Nitrogen fixing bacteria, Cultures, Ammonia.
Identifiers: *Marine salts, Ammonium-oxidizing bacteria.

Autotrophic ammonium-oxidizing bacteria response to marine salts was investigated and the distribution of the extant types considered. A membrane enumeration technique was used in the initial phase of the investigation, partly to provide test cultures. This procedure avoided contamination of the freshwater medium with seawater when seawater was the inoculum source, and the marine salts medium was not diluted with freshwater inoculum; also, in all probability, the test cultures which were obtained from colonies growing on the membrane surface, were clones with respect to the nitrifying bacteria. Autotrophic ammonium-oxidizing cultures derived from freshwaters did not require marine salts for growth. A portion of the test cultures from estuarine and marine littoral waters responded similarly. Some of the cultures from estuarine and littoral waters grew only in the presence of marine salts. The minimum concentration that supported development corresponded to 6% of full-strength seawater. Different degrees of salt-tolerance were noted among the non-salt requiring cultures. Inoculation of marine samples into seawater-based media may give rise to nitrifying enrichments that tolerate, but do not require, seawater. (Jones-Wisconsin)
W72-08583

PHOTORESPIRATION AND NITROGENASE ACTIVITY IN THE BLUE-GREEN ALGA, ANABAENA CYLINDRICA,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
M. Lex, W. B. Silvester, and W. D. Stewart.
Proceedings of the Royal Society of London, B, Vol 180, p 87-102, 1972. 7 fig, 7 tab, 41 ref.

Descriptors: *Light, *Photosynthesis, *Cyanophyta, Nitrogen fixation, Oxygen, Carbon dioxide, Biochemistry, Algae, Inhibition, Laboratory tests.
Identifiers: *Photorespiration, *Anabaena cylindrica, Acetylene reduction, Warburg effect.

Grown under aseptic conditions in nitrogen-free medium under continuous light, the photorespiration of Anabaena cylindrica and its effect on photosynthesis and nitrogenase activity were studied. In light, oxygen uptake may be up to 20 times dark respiration rate; uptake rate in light increases linearly with increasing oxygen pressure, while dark respiration is saturated at oxygen pressure near 0.05 atmospheres. DCMU, not KCN, inhibits photorespiration. Exogenously supplied hydroxyethane sulphonate, a glycollate oxidase activity inhibitor, and glycollate do not affect respiration, although C-14-labeled glycollate is assimilated in both light and dark. Photorespiration is highly sensitive to carbon dioxide pressure and to bicarbonate concentration and approaches true photosynthetic oxygen production at the carbon dioxide compensation point of 10 parts/1,000,000. Carbon dioxide concentration (0.02 atmospheres) completely inhibits photorespiration, whereas true photosynthesis is scarcely affected. Conditions which stimulate photorespiration (low pressure carbon dioxide and high pressure oxygen) progressively inhibit acetylene reduction. In short-term studies DCMU inhibits acetylene reduction under conditions stimulating photorespiration but has little effect under conditions inhibiting photorespiration. Photorespiration and nitrogenase activity apparently compete indirectly for reducing power and at least one mechanism of oxygen inhibition of nitrogenase activity is via a stimulation of photorespiration. (Jones-Wisconsin)
W72-08584

AQUATIC PLANTS FROM MINNESOTA, PART 3 - ANTIMICROBIAL EFFECTS,
Minnesota Univ., Minneapolis. Water Resources Research Center.
K. Lee Su, E. J. Staba and Y. Abul-Hajj.
Available from the National Technical Information Service as PB-209 530. Minnesota Water Resources Research Center, Bulletin 48, Feburary 1972. 36 p, 6 fig, 9 tab, 145 ref. OWRR A-025-MINN (4).

Descriptors: *Aquatic plants, *Minnesota, Bacteria, Fungi, Protozoa, Pathogens, Microorganisms, Algal toxins.
Identifiers: *Antimicrobial activity, *Skellysolve, *Filter paper disc diffusion method, *Zones of inhibition, Antifungal activity.

The antimicrobial activity of the following 22 Minnesotan aquatic plants was investigated: Anacharis canadensis, Calla polustris, Carex lacustris, Ceratophyllum demersum, Chara vulgaris, Eleocharis smallii, Lemna minor, Myriophyllum exalbescens, Nuphar variegatum, Nymphaea tuberosa, Potamogeton amplifolus, P. natans, P. pectinatus, P. richardsonu, P. zosteriformis, Sagittaria cuneata, S. latifolia, Sparganium eurycarpum, S. fluctuans, Typha angustifolia, Vallisneria americana, and Zizania aquetica. The chemical constituents responsible for the significant antimicrobial effect were isolated and identified. The skellysolve F, chloroform, 80% ethanol and fresh water extracts of plant species were tested for antimicrobial activity employing the qualitative filter paper disc diffusion method and reference antibiotic discs. Ethanol (80%) extracts of Myriophyllum exalbescens (activity ratio of 0.34 as compared to the 30 mcg chloramphenicol discs), Nymphaea tuberosa (leaf: 0.40, stem: 0.38) and Nuphar variegatum collected in Lake Minnetonka (leaf: 0.43, stem: 0.45) were moderately active against S. aureus. Ethanol (80%) extracts of Carex lucustris (activity ratio of 0.34 as compared to the 10 mcg streptomycin discs), Numphaea tuberosa (leaf: 1.01, stem: 1.10) and Nuphar variegatum collected in Lake Minnetonka (leaf: 0.73, stem: 0.58) were active against M. smegmatis. All extracts were relatively inactive against E. coli except the water extract of Potamogeton natans where a low activity ratio of 0.10 as compared to the 30 mcg chloramphenicol discs was indicated. (See also W72-05877) (Walton-Minnesota)
W72-08586

INTERNATIONAL ASPECTS OF MAN'S EFFECT UPON ENVIRONMENT,
National Academy of Sciences, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-08600

THE DISTRIBUTION, THE PHYTOSOCIOLOGICAL COMPOSITION, AND THE ECOLOGY OF THE VASCULAR MACROPHYTES IN THE MOOSACH RIVER SYSTEM NEAR MUNICH (ZUR VERBREITUNG, VERGESELLSCHAFTUNG UND OKOLOGIE DER GEFASS-MAKROPHYTEN IM FILESSWASSERSYSTEM MOOSACH (MUNCHENER EBENE)),
Technische Universitaet, Munich (West Germany). Institut fuer Landschaftspflege; and Technische Universitaet, Munich (West Germany). Institut fuer Gruenlandlehre.
A. Kohler, H. Vollrath, and E. Beisl.
Archiv fur Hydrobiologie, Vol 69, No 3, p 333-365, 1971. 10 fig, 2 tab, 51 ref. English summary.

Descriptors: *Aquatic plants, *Ecological distribution, *Distribution patterns, *River basins, Water pollution effects, Submerged plants, Phosphates, Ammonia, Oligotrophy, Eutrophication.
Identifiers: *Moosach River (Germany).

The calcareous water of the Moosach River in the Munich plateau belongs entirely to the salmonid region; it is oligotrophic in its upper part whereas the lower reaches are influenced by waste waters of the city Freising and the village Marzling. The waters do not show a concentration which might kill higher plants but an investigation of the relations existing between water pollution and higher plants was conducted. Aquatic vascular macrophytes are listed and the extent of floristic changes ascertained from comparison with earlier lists. Some oligotraphent species seem to have diminished in recent decades, while others are more frequent, probably because of eutrophication. The river system was divided into sections in which species frequency was estimated. Two distribution types can be distinguished: species occurring in the whole system regardless of the state of eutrophication and species occurring only in the purer and purest sections of the river source and upper reaches. Three associations of submerged vascular macrophytes are described. Species distribution is correlated with chemical and bacteriological water properties. Distinct correlations are established only with phosphate and ammonium content. Similar correlations exist between vascular plant occurrence and bacterial numbers. (Jones-Wisconsin)
W72-08602

SURVIVAL OF YOUNG FISH IN THE DISCHARGE CANAL OF A NUCLEAR POWER PLANT,
Essex Marine Lab., Conn.
B. C. Marcy, Jr.
Journal of the Fisheries Research Board of Canada, Vol 28, No 7, p 1057-1060, 1971, Map.
Identifiers: Canals, Discharge, Fish, Nuclear, Power plants, Survival, *Fishkills, *Thermal pollution.

No young fish of 9 species entrained in the condenser cooling-water system of a nuclear power plant survived passage to the lower end of the plant's 1.83-km (1.14-mi) discharge canal when water temperatures were above 30 C. Temperatures in the canal remained above 30 C during 95% of the period during which the fish larvae and juveniles were collected near the plant's intake. A field observation device was developed to keep alive for counting those larvae and juvenile fish that survived passage to sampling points in the system.–Copyright 1972, Biological Abstracts, Inc.
W72-08614

A SURVEY OF AMINALS IN DISTRIBUTION SYSTEMS,
Sussex River Authority (England).
For primary bibliographic entry see Field 05F.
W72-08627

COMPUTER SIMULATION OF LARGE SCALE POLLUTANT DISPERSION IN LAKE ERIE,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05B.
W72-08682

BIOLOGICAL EFFECTS OF COOLING TOWER BLOWDOWN,
National Environmental Research Center, Corvallis, Oreg.
R. R. Garton.
Preprint, of paper presented at American Institute of Chemical Engineers National Meeting, 71st, Dallas, Texas, February 20-23, 1972, 25 p, 5 fig, 9 tab, 6 ref.

Descriptors: *Cooling towers, *Toxicity, *Bioassays, Laboratory tests, Fish, Algae, Chemical wastes, Algicides, Bactericides, Chromium, Zinc, Temperature, Hydrogen ion concentration, Corrosion, Water pollution effects.
Identifiers: *Slimicides.

A simulated cooling tower blowdown waste was assembled, using those chemicals and concentrations presented in a waste discharge permit application to the Environmental Protection Agency as maximums to be released by a 1130 MWe nuclear power plant under construction. This simulated blowdown mixture and dilutions thereof were then used in bioassay experiments to determine toxicity to representatives from two trophic levels, a green alga and a salmonid fish. Bioassay results pointed out only two of the toxic compounds, zinc and chromium. Zinc was toxic to algae at 0.064 mg/l and the 96 hour LC50 to juvenile steel head was 0.09 mg/l. For chromate, no lethal effect on juvenile steel head was noted in 96 hrs. at 31 mg/l CrO4, but algal productivity was decreased at levels of 0.14 mg/l CrO4. These results indicate: (1) toxicity must be determined for each individual species exposed to blowdown mixtures; (2) safe exposure levels may be as little as 1% of the 96-hour LC50; (3) concentrations of chemicals of known toxicity must be maintained within safe levels. (Lowry-Texas)
W72-08683

THE EFFECTS OF THERMAL LOADING AND WATER QUALITY ON ESTUARINE PRIMARY PRODUCTION,
Maryland Univ., Solomons. Natural Resources Inst.
J. A. Mihursky, D. A. Flemer, D. H. Hamilton, Jr., and C. W. Keefe.
Available from the National Technical Information Service as PB-209 811. Final Completion Report, October 1971. 55 p, 6 fig, 5 tab, 17 ref. OWRR B-010-MD (1).

Descriptors: *Thermal pollution, *Hydroelectric plants, *Water pollution effects, *Estuaries, *Maryland, Water quality, Water temperature, Nutrients, Phytoplankton, Phosphorus, Sediments, Industrial wastes, Ecology, Environmental effects, Data collections, Dissolved oxygen.
Identifiers: *Patuxent River (Md).

A study was made of the effects of thermal pollution on hydrography, nutrients, phytoplankton standing crop, and primary production in the Patuxent estuary (Maryland) from September 1970 to June 1971. Residual chlorine from the water passing through the condensers of the Chalk Point Power Plant reduces phytoplankton production in the effluent canal to a greater extent than would be expected from simple mixing of condenser water with augmentation water. Nutrient concentrations in Western Branch were higher during this study year than during the previous years. Also, standing crop and primary production in the lower study area were higher during the winter of this study year than during the previous winters. Measurements of sedimentary carbon, nitrogen and phosphorus indicate great depositions of phosphorus in the sediments from Lower Marlboro to Hollowing Point. (Woodard-USGS)
W72-08706

ISOLATION OF ANAEROBES.
For primary bibliographic entry see Field 05A.
W72-08737

MERCURY CONCENTRATIONS IN THE AQUATIC LIFE FORMS AND IN THE WATERS OF THE UPPER CLARK FORK RIVER,
Montana Univ., Missoula. Dept. of Chemistry.
W. P. Van Meter.
Available from the National Technical Information Service as PB-209 638. Montana Joint Water Resources Research Center, Bozeman, Completion Report (1972). 13 p, 2 fig, 4 tab, 9 ref. OWRR-A-044-MONT (1).

Descriptors: *Metals, *Mercury, *Chemical analysis, *Spectroscopy, *Fish, *Pollutants, Water pollution, Water pollution effects, *Toxicity, Water pollution sources, Public health, *Montana.
Identifiers: *Clark Fork River (Mont).

Nine points on the Clark Fork River and 15 points on its major tributaries were surveyed to determine the mercury concentration in several fish species. There is no apparent connection between mercury concentrations in fish tissue and mining activity now occurring in the Butte-Anaconda area. Neither is there any apparent connection between these concentrations and the large pulp mill 10 miles west of Missoula. There may be a relation to early-day placer mining activity (Flint Creek), but this is not free of doubt. It is likely that most of the observed levels of mercury in fish are due to slow insertion of mercury into natural waters by ordinary weathering processes of the minerals present in the countryside.
W72-08741

DATA ON THE ALGAL FLORA AND BIOMASS OF FOUR BIOTYPES,
Louvain Univ. (Belgium). Laboratorium Algologie.
A. Louis, and N. Podoor.
Biol Jaarb. 38: 1970. 109-150.
Identifiers: Algal, Biomass, Biotypes, Flora, Minerals, Netherlands, pH, Pollution.

The water and algae were studied in 4 different Dutch Biotypes in the area of the Dyle valley. Cyanophyta, Euglenophyta, Chrysophyta, Pyrrophyta and Chlorophyta were present. The variable physical features of the water such as its pH and mineral content were determined mostly by the mineral composition of the rocks. The algal contents both in terms of its bulk and mass and its species distribution also varied from area to area. Pollution caused a large increase in 1 or 2 spp. following contamination. This may result from a strong preference for and ability to use the pollutant.—Copyright 1971, Biological Abstracts, Inc.
W72-08743

STUDIES ON THE SPATIAL HETEROGENEITY OF SHALLOW WATER BENTHOS WITH PARTICULAR REFERENCE TO THE CHIRONOMIDAE,
Mount Allison Univ., Sackville (New Brunswick). Dept. of Biology.
C. G. Paterson, and C. H. Fernando.
Can J Zool. 49 (7): 1013-1019. 1971.
Identifiers: Benthos, Chironomidae, Chironomus-Abortivus, Glyptotendipes-Barbipes, Heterogeneity, Oligochaeta, Procladius-Freemani, Shallow, Spatial.

The examination of numbers of 6-in. Ekman grab samples from areas of 2 m2 or less in a variety of shallow lentic habitats revealed heterogeneity in the spatial distribution of most species of macrobenthos in each habitat. Chironomus abortivus Malloch, Glyptotendipes barbipes (Staeger), Procladius freemani Sublette, and the Oligochaeta were invaribaly aggregated when their population densities were adequate to determine a distributional pattern. The Chironomidae, considered as a group, also displayed an aggregated distribution in all habitats. Other benthic species had distributional patterns that varied from random to highly aggregated in the different habitats. No evidence was found that any species are normally randomly distributed. Analyses of mean crowding of the common species in each habitat suggest that the species often respond independently to microenvironmental variations. The factors which produce well-defined aggregations of one species may be neutral, or they may have the opposite effect on the distribution of other species. Experimental examination of the possible occurrence of behavioral mechanisms of aggregation in the 2 chironomids, C. attenuatus Walker and G. barbipes, revealed that they tend to aggregate at low population densities (approx 1/10 cm2) but are randomly distributed in a uniform environment when present in higher densities. Because of the aggregated nature of most benthic species four 6-in. Ekman grab samples were usually required to obtain a population estimate of the total fauna, total chironomid fauna, and the dominant species within plus or minus 30% of the mean obtained with a larger number of samples.—Copyright 1972, Biological Abstracts, Inc.
W72-08764

MORPHOLOGICAL VARIABILITY OF ALGAE, CAUSED BY CULTIVATION CONDITIONS,
J. Ruzicka.
Algol Stud. Vol 4. p 146-177. 1971. Illus. English summary.
Identifiers: *Algae, Cell, *Cultivation, Light, *Morphological variability, Size, Taxonomy, Temperature.

The morphological features of algae, especially the cell size of the most species, are very variable under the influence of environmental conditions. The influence of various cultivation conditions (especially temperature and illumination) on the changes of the cell morphology was studied. Changes were regular, reproducible and reversible, but differ in their quantity in different species. They persist only for the time of the given cultivation conditions. This adaptability of the morphological features to the environmental conditions must also be remembered in regard to taxonomy.—Copyright 1972, BiologicalAbstracts, Inc.
W72-08777

STUDY OF THE ADAPTATION OF GUPPIES TO PHENOL,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
B. A. Flerov.
Gidrobiol Zh. Vol 6, No 3, p 104-106. 1970. Illus.
Identifiers: *Adaptation, *Guppies, Lebistes reticulatus, *Phenol.

Data from 670 specimens of Lebistes reticulatus were studied. There was no adaptation to phenol in subtoxic concentrations of 12.5 mg/l in experiments lasting 1 yr and 8 mo., 16.7 mg/l for up to 1 mo. and increased concentrations from 2-12 mg/l lasting 6 mo.—Copyright 1972, Biological Abstracts, Inc.
W72-08783

CONTRIBUTIONS TO THE KNOWLEDGE OF THE FRESH WATER ALGAE OF PORTUGAL, I,
Coimbra Univ. (Portugal). Institute Botanico Dr. Julio Henriques.
M. Santos.
Anu Soc Broteriana. Vol 36, p 87-125. 1970.
Identifiers: *Algae, *Chlorophyta, *Chrysophyta, *Euglenophyta, Portugal.

Classification, taxonomy and descriptions of 39 taxa, of which only 2 types were previously cited for Portugal are given. The form, texture, color and size range of each species is indicated, and references to the literature are provided. The classes of algae described include the Euglenophyta, Chrysophyta and Chlorophyta.—Copyright 1972, Biological Abstracts, Inc.
W72-08785

CHESAPEAKE BAY BACTERIA ABLE TO CYCLE CARBON, NITROGEN, SULFUR AND PHOSPHORUS,
Maryland Univ., Catonsville. Div. of Biological Sciences.
P. R. Burchard.
Chesapeake Sci. Vol 12, No 3, p 179-180. 1971. Illus.
Identifiers: *Bacteria, Bay, Carbon, *Chesapeake Bay, Nitrogen, Phosphorus, Sulfur, Food chains.

It is demonstrated that there are a variety of bacteria (chemo- and phototrophs, auto- and heterotrophs) involved in mineralization and in the cycling of C, N, S, and P in Chesapeake Bay. Whether they are indigenous or of terrestrial origin is not known. Their role in the food web and in the overall nutrient status of the Bay is yet to be determined.--Copyright 1972, Biological Abstracts, Inc.
W72-08787

MERCURY IN FISH AND FISH-EATING BIRDS NEAR SITES OF INDUSTRIAL CONTAMINATION IN CANADA,
University of Western Ontario, London. Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W72-08789

BENTHIC ALGAE IN POLLUTED ESTUARIES,
Durham Univ. (England). Dept. of Botany.
P. Edwards.
Marine Pollution Bulletin, Vol 3, No 4, p 55-60, April 1972. 4 fig, 4 tab, 13 ref.

Descriptors: *Algae, *Estuaries, *Waste disposal, *Sewage, *Industrial wastes, Water pollution sources, On-site investigations, Methodology, Foreign research, Marine algae, Productivity, Pollutants, Chemical wastes, Sewage effluents, Water pollution effects.
Identifiers: *England, *Polluted estuaries, Durham County rivers.

On-site studies were made of three estuaries in northeastern England in which different conditions of pollution exist. The rivers, located in County Durham, are the Wear, a relatively unpolluted stream, the Tyne, which receives a large volume of untreated sewage, and the Tees, which is mixed with industrial wastes. These systems provide a huge natural experiment since the degree or type of pollution is probably the only environmental factor that varies significantly between the three estuaries. The algal flora of the estuaries is compared to reveal the effects of different kinds of contamination. A total of 69 stations at about 1 km intervals reaching from the mouth to the tidal limit of each estuary were used to determine the various species of algae. Vegetation identified consists of 54 species from the three estuaries; these are listed. A table also gives the species of benthic marine algae in the Tees estuary for 1935. A decrease in algal vegetation since the 1930's in the Tees is probably due to growth of the chemical industry and the associated discharge of toxic chemical wastes. (Lang-USGS)
W72-08804

THE TOXICITY OF TEN ORGANIC INSECTICIDES TO VARIOUS AQUATIC INVERTEBRATES,
Utah Univ., Salt Lake City. Dept. of Zoology and Entomology.
A. R. Gaufin, L. D. Jensen, A. V. Nebeker, T. Nelson, and R. W. Teel.
Water and Sewage Works, Vol 112, No 7, p 276-279, July 1965. 5 tab, 3 ref.

Descriptors: *Insecticides, Fish, Aquatic insects, Toxicity, Bioassay, Caddisflies, Stoneflies, Mayflies, Shrimp, Aquatic animals, *Water pollution effects, Lethal limit.

Bioassay methods to determine toxic limits were used to test ten of the most common insecticides. Results on caddisflies, stoneflies, fresh water shrimp, and mayflies are discussed. Many different species were tested. The caddisflies were highly susceptible to fungus when maintained at 65F. Also they were very susceptible to mechanical injury during handling. (Bean-AWWARF)
W72-08857

BIOASSAYS DETERMINE PESTICIDE TOXICITY TO AQUATIC INVERTEBRATES,
Utah Univ., Salt Lake City. Dept. of Zoology and Entomology.
A. R. Gaufin, L. Jensen, and T. Nelson.
Water and Sewage Works, Vol 108, No 9, p 355-359, September 1961. 5 fig, 2 tab, 9 ref. NIH E-1436 (C3).

Descriptors: Water treatment, *Pesticides, Insecticides, *Toxicity, *Fish, Aquatic insects, *Bioassay, *Water pollution effects, *Analytical techniques, Water quality, *DDT, Resistance, Lethal limit, *Invertebrates.
Identifiers: *Malathion, *Parathion.

Objectives were to determine (1) if a particular insecticide is toxic to those species of aquatic insects which are important as fish food, (2) bioassay methods for determining the toxicity of chemicals or wastes to fish food organisms, (3) the level of toxicity under conditions of short and long time exposures and safe levels for certain periods of exposure, (4) the relative toxicity of insecticides to fish and fishfood organisms, and (5) how the toxicity of various insecticides varies with changes in water quality characteristics. As partial fulfillment of the objectives, the median tolerance limits (TLm) of malathion, DDT and parathion are reported for several types of fish. (Bean-AWWARF)
W72-08862

EUTROPHICATION FACTORS IN NORTH CENTRAL FLORIDA LAKES,
Florida Univ., Gainsville. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05B.
W72-08986

PROBLEM LAKES IN THE UNITED STATES,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 02H.
W72-08987

VITAMIN B12 PRODUCTION AND DEPLETION IN A NATURALLY OCCURRING EUTROPHIC LAKE,
Oregon State Univ., Corvallis. Dept. of Microbiology; and Oregon State Univ., Corvallis. Dept. of Oceanography.
A. Gillespie, and Y. Morita.
Applied Microbiology Vol. 23, No. 2, p 341-348, 1972, 11 fig, 3 tab, 9 ref. EPA Program no. 16010 EBB 02/72.

Descriptors: *Vitamin B, *Eutrophication, *Aquatic microbiology, Oregon, *Sediment-water interfaces, Sediments, Aquatic productivity, Phytoplankton, Algae.
Identifiers: Upper Klamath Lake (Oregon).

The distribution of vitamin B12 within Upper Klamath Lake was surveyed at approximately monthly intervals during a period from September 1968 to November 1969. High concentrations (up to 1.8micro g/g of dry sediment) characteristically occurred at the water-sediment interface, with a sharp decline below this area. A heavy bloom of Aphanizomenon flos-aquae occurred from the latter part of May through October 1969. B12 concentrations of the uppermost sediments, from all but one sampling site, increased gradually through the bloom followed by a drastic increase during the die-off period. B12 is probably not a limiting factor for primary productivity, since sufficient levels of this vitamin were found to occur throughout the year. Of 42 cultures isolated from Upper Klamath Lake water and sediments, 20 were found capable of producing 50pg or more of B12/ml of medium. Phytoplankton samples were found to contain up to 5 micro g of B12/g of dry material. Degradation of B12 occurred in sterilized as well as fresh sediment samples. (EPA abstract)
W72-08989

SOME ECOLOGICAL EFFECTS OF ARTIFICIAL CIRCULATION ON A SMALL EUTROPHIC NEW HAMPSHIRE LAKE,
New Hampshire Univ., Durham. Dept. of Zoology.
R. C. Haynes.
PhD thesis, 1971. 166 p, 13 fig, 21 tab, 93 ref. OWRR A-004-NH (6).

Descriptors: *Aeration, *Eutrophication, *Ecological distribution, *Aquatic algae, *Cyanophyta, *Beggiatoa, Phytoplankton, *New Hampshire, Mixing, Environmental effects.
Identifiers: *Artificial circulation, *Kezar Lake (NH).

For several years annual noxious blue-green algal blooms plagued Kezar Lake, N. H. Artificial circulation was tried in an attempt to improve lake conditions. This study was made to help understand some of the ecological effects of mixing the lake. Samples collected weekly were analyzed by standard methods. Artificial circulation completely destratified Kezar Lake and isothermal conditions were maintained throughout the test periods of 1968 and 1969. The supply and distribution of oxygen, carbon dioxide, alkalinity and many algal nutrients were measured before and after lake mixing. Concentrations of the bloom-forming algae occurred after lake mixing in both 1968 and 1969, but Secchi disk readings improved. Chlorophyll concentration in relation to blooming of A. FLOS=AQUAE WAS DETERMINED AND RATE OF CARBON FIXATION BY PHYTOPLANKTON WAS EXPLORED. A discussion of the results is included and a comparison made with the findings of other authors.
W72-09061

MODELLING WATER QUALITY FROM AGRICULTURAL LANDS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 06A.
W72-09077

DETERMINATION OF A NITROGEN--PHOSPHORUS BUDGET FOR BAYOU TEXAR, PENSACOLA, FLORIDA,
Florida Univ., Gainesville. Water Resources Research Center.
G. A. Moshiri, R. P. Hannah, A. T. Simmons, G. C. Landry, and N. H. Whiting.
Available from the National Technical Information Service as PB-209 867. Florida Water Resources Research Center Publication No. 17, 1972. 27 p, 11 fig, 4 tab, 13 ref. OWRR A-021-FLA (1).

Descriptors: *Nitrogen, Nitrates, Nitrites, Ammonia, *Phosphorus, Phosphates, *Primary productivity, *Nitrogen fixation, Sediment, Organic carbon, *Eutrophication, *Florida, *Photosynthesis, Path of pollutants, Water pollution effects, Nutrients.
Identifiers: *Bayou Texar (Fla).

The extent of nitrogen and phosphorus inputs and their effects on algal productivity in Bayou Texar, Pensacola, Escambia County, Florida, has been under investigation since June, 1971. To date, results indicate Carpenter's Creek to be the major source of nutrient input in this estuarine bayou. In general, nitrogen and phosphorus concentrations are highest at the north end of the Bayou and decrease southward--a pattern which is directly related to carbon fixation rates, but inversely related

to the extent of nitrogen fixation by the nitrogen fixing organisms in the Bayou. Preliminary results also suggest presence of phosphorus in the sediment muds and replenishment of water column phosphorus by phosphorus from the sediment. All phases of the project are being continued in order to determine seasonal trends as well as other sources of nutrient input. Concerted efforts are being directed toward the kinetics of phosphorus exchange between the sediment and the water column. (Morgan-Florida)
W72-09087

ASPECTS OF PHOSPHORUS CYCLING IN BRACKISH WATERS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
E. J. Kuenzler.
Available from the National Technical Information Service as ORO-3549-7, $3.00 in paper copy, $0.95 in microfiche. 1970. 47 p, 7 fig, 4 tab, 60 ref. Contract No. AT (40-1)-3549.

Descriptors: *Phosphorus, *Cycles, *Brackish water, Phosphorus compounds, Ponds, Ponding, Cycling nutrients, Water types, Estuaries, Water quality control, Phytoplankton, Zooplankton, Aquatic life, Kinetics, Movement, Inorganic compounds, Eutrophication, Phosphorus radioisotopes, Tagging, Tracers, Aquatic microorganisms, Diatoms, Nutrients, Radioactivity techniques, Absorption, Primary productivity, Water analysis, Sewage lagoons, Path of pollutants.
Identifiers: Biological magnification, Biological samples, Sample preparation, P-32, Rhodomonas lens, Dissolved organic phosphorus, Dissolved inorganic phosphorus, Particulate phosphorus, Nannochlorus atomus, Nitzschia frustulum, Nitzschia closterium, Cyclotella caspia, Monallantus stichococcoides, Monodus guttula, Oocystis parva, Chaetoceros muelleri, Cyclotella cryptica, Thalassiosira fluviatilis, Dunaliella tertiolecta, Synechococcus, Phacodactylum, Ochromonas.

Phosphorus and its cyclic kinetics, intake, metabolism, and excretion by plankton and algae in brackish water ponds were studied. Tagging methods, analytical techniques, and the concept of phosphorus flux through the water system entering the estuarine environment are discussed. Emphasis is placed upon dissolved inorganic phosphorus (DIP), dissolved organic phosphorus (DOP), and particulate phosphorus (PP) as they enter the system and are interchanged by the organisms in the pond. The effects of temperature, light, and darkness on the phosphorus cycle and the relationship of phosphorus to problems of estuarine eutrophication are also considered. (Mackan-Battelle)
W72-09090

KAISER REFRACTORIES ENVIRONMENTAL STUDIES,
Moss Landing Marine Labs. Calif.
J. P. Harville.
Available from the National Technical Information Service as COM-71-01107, $3.00 in paper copy, $0.95 in microfiche. Report No. TP-71-3, NOAA-71112214, June 1, 1971. 201 p, 61 fig, 33 tab, 31 ref. Grant No. GH-94.

Descriptors: *Industrial wastes, *Water pollution effects, Effluents, California, Sediments, Sampling, Chlorophyll, Sediment transport, Benthic fauna, Plankton, Bioindicators, Currents (Water), Tides, Wind, Light, Waves, Clams, Crustaceans, Worms, Mollusks, Water temperature, Salinity, Sea water, Water quality, On-site tests, Hydrogen ion concentration, Calcium, Magnesium, Algae, Cyanophyta, Diatoms, Mussels, Phytoplankton, Laboratory studies, Mortality, Crabs, Bioassay, Littoral drift, Invertebrates, Calcite, Silicon, Sodium, Potassium, Periphyton, Aluminum, Iron, Quartz, Sewage, Annelids, Topography, Copepods, Isopods, Nematodes, Gastropods, Organic matter, Zooplankton, Fish eggs, Amphipods, Perches, Chrysophyta, Pyrrophyta, Dinoflagellates, Protozoa, Rotifers, Larvae, X-ray diffraction.
Identifiers: *Moss landing, Barnacles, Lethal dosage, Calcium ion concentration, Vertebrates, Absorbance, Magnesium ion concentration, Brucite, Bottom topography, Prionospio, Lumbrinereis, Glycera, Nephtys, Capitella, Magelona, Armandia, Tellina buttoni, Venus, Tivela stultorum, Emerita analoga, Diastylopsis, Oxyurostylis, Hemilamprops, Lamprops, Colurostylis, Cumella, Bathycuma, Leptostylis, Leucon, Brachyura, Anomura, Olivella, Metzgeria, Nassarius, Velutina, Polinices, Colus, Clinocardium, Zirfaea, Coscinodiscus.

A long-range study was conducted of potential effects of the Kaiser Refractories industrial effluent on the marine environment of the Moss Landing area. The investigations followed three primary thrusts: (1) Determination of physical characteristics and dynamics of the water mass in the proposed outfall area, and assessment of bottom structure, sediments, and sediment transport characteristics of the area. (2) Biological investigations of bottom fauna of the proposed outfall area, with ancillary studies of plankton, fishes, and intertidal fauna. (3) Field and laboratory studies of the impact of various dilutions of Kaiser effluent upon selected bioindicator plant and animal species. Selected conclusions are: (A) Investigations of benthic communities indicate great variability in the distribution and population densities of organisms. The following generalizations appear significant: (1) The Pismo clam (Tivela stultorum), the button clam (Tellina buttoni), and certain polychaete worms are dominant. (2) Crustaceans appear to constitute an important component of the surface fauna, and polychaete worms usually dominate the sediments below the surface. (3) Dumping of dredge spoil has an immediate devastating effect upon the benthic community, but the community appears to recover in the year following. (B) The Kaiser effluent is characterized chemically by high pH, high calcium ion concentrations, low magnesium ion concentrations, and is charged with a milky-white precipitate which is principally calcite (CaCO3) and brucite (Mg (OH)2). (C) The Kaiser effluent sharply restricted the amount and variability of biota. (D) The photosynthetic rate of mixed phytoplankton cultures indicated a linear depression of that rate by the Kaiser effluent. (E) Undiluted effluent (approximately 1700 ppm Ca ions) was lethal to copepods to various dilutions of the effluent for 24 hour periods, but gradual adaptation to up to 50 percent effluent was possible. (F) The size and abundance of mussels are directly related to distances from the Kaiser outfall. (G) The common sand crab, Emerita analoga, is sensitive physiologically to abnormally high calcium-magnesium ratios. (H) The Pismo clam, Tivela stultorum, showed behavioral and physiological damage when subjected to high concentrations of Kaiser effluent under laboratory conditions. (Mortland-Battelle)
W72-09092

THE EFFECT OF LOW CONCENTRATIONS OF PHENOL ON ANTIBODY FORMATION IN CARP, CYPRINUS CARPIO L.,
Akademiya Nauk SSSR, Moscow. Institut Biologia Vnderennykh Vod.
G. D. Goncharov, and V. R. Mikryakov.
Available from the National Technical Information Service as PB-203 804T, $3.00 in paper copy, $0.95 in microfiche. Bureau of Commercial Fisheries, Translation. June 1971. 8 p.

Descriptors: *Carp, *Phenols, *Water pollution effects, Fish, Aquatic animals, Chemical wastes, Water pollution sources, Bacteria, Resistance, Inhibitors, Toxicity, Proteins, Bioassay, Analytical techniques, Animal physiology.
Identifiers: Immunoglobulins, Antibodies, Antigens, Agglutination reaction, Immunologic responses, Serum, Biological samples, Laboratory techniques.

To test the hypothesis that antibody formation is either maintained or disrupted in fish held in a phenol solution, experiments were conducted with four groups of young-of-the-year carp under aquarium conditions at 12-14 C. Two groups of the test organisms were held in a daily prepared phenol solution of 12.5 mg/l for two months. One group each of test and control organisms received no food while the others were fed daily. All were immunized with three-stage intraperitoneal injections of Aeromonas punctata vaccine of 150-200 million bacterial cells at five-day intervals. After the last injection on the 45th day, the fish were sacrificed and the agglutination reaction investigated. Total protein of the blood sera was also measured using the refractometer. Under the conditions of phenol intoxication, antibody formation (formation of immunoglobulins) was expressed more weakly than in control fish, and total protein decreased both in starved and non-starved carp. Apparently, the motor-food activity of the fish was disturbed under the prolonged influence of phenol, thereby intensifying endogenous feeding, which in turn led to a decrease in antibody synthesis. Simultaneously, a possible disturbance to information preception by immunoglobulin producer-cells could depress the resistance of the fish to infection. (Mackan-Battelle)
W72-09093

THE ARISAL OF MALFORMATIONS IN THE EMBRYONAL DEVELOPMENT OF FISH UNDER THE INFLUENCE OF HEXACHLOROCYCLOHEXANE,
Petrozavodsk State Univ., (USSR).
A. F. Samylin.
Translation available from the National Technical Information Service as PB-203 811T, $3.00 in paper copy, $0.95 in microfiche. Bureau of Commercial Fisheries, Translation. 1971. 8 p.

Descriptors: *Salmon, *Toxicity, *Water pollution effects, *Embryonic growth stage, Fisheries, Water quality, Growth stages, Larvae, Fry, Ammonium compounds, Nitrogen compounds, Carbonates, Fish, Pollutants, Poisons, Organic compounds, Industrial wastes, Inorganic compounds.
Identifiers: *Ammonium carbonate, *Hexachlorocyclohexane, Germ layer formation, Gastrulation, Blastula, Organogenesis, Teratogenic effects.

Two toxic substances, ammonium carbonate and hexachlorocyclohexane in petrolatum, were investigated regarding their effect on the development of salmon from the moment of fertilization to age one plus (2 summers). Ammonium carbonate was found to (1) have its greatest influence on germ layer formation, especially the initial period of gastrulation; (2) produce no marked morphological changes in embryos that survived concentrations of 5, 10, and 50 mg/l; and (3) exert the greatest influence on fish after the embryos hatched when the concentration was 100 mg/l. With hexachlorocyclohexane, germ layer formation was also most affected but a considerable number of deformities and death were observed at the blastula stage; deformities appeared at all stages of development in the different concentrations. Hexachlorocyclohexane exerted the greatest influence on blood, the circulatory system, and the hematopoietic function. Based on this study, it appears that the most sensitive stages in regard to toxic substances are the start of both gastrulation and organogenesis as well as the transition to mixed feeding. (Mackan-Battelle)
W72-09095

ESTIMATION OF THE BIOMASS OF PLANKTON,
Municipal Waterworks of Amsterdam (Netherlands).
For primary bibliographic entry see Field 05A.
W72-09100

RELATIONSHIP BETWEEN LIGHT CARBON DIOXIDE FIXATION AND DARK CARBON DIOXIDE FIXATION BY MARINE ALGAE,
Nova Univ., Dania, Fla. Physical Oceanographic Lab.
I. Morris, C. M. Yentsch, and C. S. Yentsch.
Limnology and Oceanography, Vol. 16, No. 6, p 854-858, November 1971. 2 fig, 2 tab, 6 ref.

Descriptors: *Light intensity, *Primary productivity, *Radioactivity techniques, *Photosynthesis, Carbon dioxide, Phytoplankton, Algae, Cultures, *Florida, Sea water, Chlorophyll, Nitrates, Nitrites, Phosphates, Nutrients.
Identifiers: *Florida Strait, Carbon-14, Dunaliella tertiolecta, Phaeodactylum tricornutum.

Experiments were conducted on natural populations (in the Florida strait) and cultured marine phytoplankton (Dunaliella tertiolecta and Phaeodactylum tricornutum) to determine rates of dark fixation of carbon dioxide. Such information is important to a better understanding of the Carbon-14 technique for assessing primary productivity. The ratio of carbon dioxide fixation in light to that in dark increases with increasing concentrations of phytoplankton. This is true in both natural populations and cultures. Possible explanations of this are presented and discussed and the use of dark fixation values in the Carbon-14 technique is considered. The C-14 technique is only as good as the knowledge of how the carbon is fixed. (See also W72-09103) (Mortland-Battelle)
W72-09102

THE PHYSIOLOGICAL STATE WITH RESPECT TO NITROGEN OF PHYTOPLANKTON FROM LOW-NUTRIENT SUBTROPICAL WATER AS MEASURED BY THE EFFECT OF AMMONIUM ION ON DARK CARBON DIOXIDE FIXATION,
Nova Univ., Dania, Fla. Physical Oceanographic Lab.
I. Morris, C. M. Yentsch, and C. S. Yentsch.
Limnology and Oceanography, Vol. 16, No. 6, p 859-868, November 1971. 4 fig, 3 tab, 11 ref.

Descriptors: *Phytoplankton, *Nitrogen, *Nutrients, *Photosynthesis, Light intensity, Ammonia, Carbon dioxide, Florida, Cultures, *Algae, Incubation, Centrifugation, Radioactivity techniques, Chlorophyll, Sea water, Ions, Nutrient requirements, Aquatic populations, Primary productivity.
Identifiers: Carbon-14, *Florida Strait, Dunaliella teriolecta, Phaeodactylum tricornutum, Skeletonema costatum, Carboy, Oscillatoria erythraea.

Studies conducted with three species of marine algae (Dunaliella tertiolecta, Phaeodactylum tricornutum, and Skeletonema costatum) indicate that there is no increase in dark fixation in non-nitrogen deficient cultures after the addition of ammonium ion. The presence of ammonium ions had no effect on the capacity for light fixation of Carbon-14. The experiments were conducted in low-nitrogen, subtropical waters of the Florida Strait, and the results indicated that the phytoplankton cells were not physiologically nitrogen deficient, although nitrogen may limit population size. The ammonium ion enhancement which was used offers the advantage of assessing the population at time zero. When enhancement was not noted at time zero, incubation of the water in a carboy resulted in depletion of the available nitrogen and a physiological state of nitrogen deficiency subsequently became measurable by this method. The eventual positive results from the test therefore confirm the negative results at time zero. (See also W72-09102) (Mortland-Battelle)
W72-09103

SEQUENTIAL MORTALITY OF THE FISH FAUNA IMPOUNDED IN CONSTRUCTION OF A MARINA AT DANA POINT, CALIFORNIA,
California Univ., Los Angeles.
John P. Waggoner, III, and Robert C. Feldmeth.
Calif Fish Game. 57 (3): 167-176. 1971.
Identifiers: California, Construction, Dana, Elasmobranchs, Fauna, Fish, Flatfishes, Impounded, Marina, Mortality, Point, Sequential.

Environmental parameters such as dissolved O2, water temperature, and salinity were monitored in a drawn-down impoundment at Dana point, California, during July and Aug., 1969. Sequential mortality of marine fishes occurred in this impoundment. The first major peak of mortality corresponded to a 2 to 5 ppm in O2 and a temperature increase of 8 to 9 C. The other 2 peaks corresponded to temperature peaks 10 to 12 C above ocean temperatures. Surfperch (Embiotocidae) seemed to be least tolerant of environmental stresses encountered, while elasmobranchs and flatfishes were the most tolerant.--Copyright 1971, Biological Abstracts, Inc.
W72-09104

DISTRIBUTION OF PHYTOPLANKTON IN A POLLUTED SALINE LAKE, ONONDAGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Div. of Biological Sciences.
P. Sze, and J. M. Kingsbury.
Journal of Phycology, Vol. 8, No. 1, p 25-37, March 1972. 4 fig, 2 tab, 42 ref.

Descriptors: *Phytoplankton, *Distribution patterns, *Systematics, *Saline lakes, *Eutrophication, Water sampling, Water pollution effects, Biomass, Nutrients, Algae, Euglenophyta, Chrysophyta, Chlorophyta, Pyrrophyta, Cyanophyta, Manganese, Zinc, Metals, Secchi disks, Heavy metals, Bioindicators, Silica, Chromium, Copper, *New York, Diatoms, Phosphorus, Nitrogen, Chlorella, Chlamydomonas, Scenedesmus, Dinoflagellates, Euglena, E. coli, Phosphates, Dissolved oxygen, Biochemical oxygen demand, Hydrogen ion concentration, Calcium, Sodium, Potassium, Magnesium, Iron.
Identifiers: *Onondaga Lake, Oedogonium, Rhizoclonium, Cosmarium, Phacus, Chaetoceros, Mougeotia, Navicula, Pinnularia, Surirella, Peridinium, Seneca River, Ninemile Creek, Van Dorn sampler, Kemmerer sampler, Chlamydomonas epiphytica, Chlamydomonas spp, Carteria fritschii, Pandorina morum, Sphaerocystis schroeteri, Ulothrix spp, Microthamnion kuetzingianum, Micractinium pusillum, Errerella bornhemiensis.

During 1969, Onondaga Lake (New York) was regularly sampled at five sites in order to study the phytoplankton. Samples obtained for quantitative examinations were taken from the surface waters at all stations and at depths of 3, 6, and 12 m at two stations using dippers and Van Dorn or Kemmerer samplers. Samples for gross qualitative analyses were obtained by making vertical and horizontal hauls with a No. 20 net at each station. An IBM 1130 computer was used for analyzing the raw data. The lake is relatively saline and has been found to support an algal flora characteristic of a eutrophic lake with an admixture of saline species. Seasons in the lake can be identified by floral succession with certain species of algae appearing first at the outflow and then spreading through the lake. Phosphorus and nitrogen were never limiting, but silica diminution was limiting for further diatom population growth and was related to diatom blooms. Since the eutrophic layer was much shallower than the thermocline, turbulence and mixing were thought to play an important role in controlling certain populations. No obvious controlling relationship existed between herbivores and phytoplankton populations. Cr and Cu were high as a result of industrial discharges and may be responsible for inhibiting blooms. Biomass was calculated for the major phytoplankters. (Holoman-Battelle)
W72-09111

SELENIUM: RELATION TO DECREASED TOXICITY OF METHYLMERCURY ADDED TO DIETS CONTAINING TUNA,
Wisconsin Univ., Madison. Dept. of Nutritional Sciences.
H. E. Ganther, M. L. Sunde, C. Goudie, M. J. Kopecky, and P. Wagner.
Science, Vol. 175, No. 4026, p 1122-1124, March 10, 1972. 1 fig, 1 tab, 12 ref.

Descriptors: *Toxicity, *Marine fish, Mercury, Trace elements, Fish, Birds, Food chains, Absorption, Food.
Identifiers: *Selenium, *Tuna, *Methylmercury, *Japanese quail, Quail, Coturnix coturnix japonica, Swordfish, Rats, Biological magnification, Mercury compounds.

Japanese quail were used in experiments to investigate the effects of varying concentrations of mercury in diets containing tuna, and to determine what factor present in tuna decreases the toxicity produced with high concentrations of methylmercury. Two groups of quail received a corn-soya diet containing mercury in concentrations of 0 or 20 ppm and other groups were fed diets containing 17 percent tuna with varying concentrations of Hg (0.075 - 20 ppm). The selenium concentration in tuna varied proportionally to the mercury content. The quail given 20 ppm of mercury in diets containing 17 percent tuna survived longer than quail given the same concentration of Hg in a corn-soya diet. In prior experiments, it was shown that selenium in the diet comparable to that supplied by tuna decreased methylmercury toxicity in rats. Selenium in tuna, far from being a hazard in itself, may lessen the danger to man of mercury in tuna. (Synder-Battelle)
W72-09117

A LIST OF NEW GENERA AND TYPE SPECIES OF FLAGELLATES AND ALGAE PUBLISHED IN 1969, PART V,
For primary bibliographic entry see Field 05A.
W72-09119

CARBON DIOXIDE AND PRIMARY PRODUCTIVITY IN THE GLACIAL FIORD SYSTEM OF SOUTHEAST ALASKA,
Alaska Univ., College. Inst. of Marine Science.
L. L. Longerich, M. Billington, V. Alexander, J. J. Kelley, and D. W. Hood.
Available from the National Technical Information Service as AD-734 672, $3.00 in paper copy, $0.95 in microfiche. Report No. R71-19, September 1971. 24 p, 1 fig, 1 tab, 5 ref. ONR Contract N00014-67-AO-317-0001AB.

Descriptors: *Carbon dioxide, *Primary productivity, Alaska, Fiords, Surface waters, Nitrogen, Sea water, Winds, Sampling, Incubation, Runoff, Salinity, Depth, Absorption, Algae, Seasonal, Weather, Water analysis, Tracers, Radioactivity techniques.
Identifiers: Auke Bay, Glacial water, Beckman analyzer, Van Dorn samplers, C-14, Biocarbonates.

Early spring studies of carbon dioxide concentrations and primary productivity were made in the glacial fiord system of Southeastern Alaska. The surface waters of Auke Bay at the beginning of the spring bloom had a lower carbon dioxide concentration and higher particulate nitrogen and carbon-14-HCO3 uptake than the more open waters surrounding it. Surface water carbon dioxide in a glacial outflow area was unexpectedly low compared to values for surface seawater in a normal fresh water stream outflow. An example of wind induced upwelling was noted which produced increased surface carbon dioxide concentrations over the duration of a storm. It was evident from previous carbon dioxide studies and from this survey that surface carbon dioxide concentrations are dependent on location, primary productivity, proximity to fresh water runoff, the season, and the weather. Past work shows that long-term, on-

site multidisciplinary observations are essential to an understanding of how carbon dioxide interacts in the marine environment. (Mortland-Battelle)
W72-09122

ACCUMULATION OF CALCIUM-45 IN DEVELOPING COHO SALMON EGGS AND FRY REARED IN VARYING CONCENTRATIONS OF STABLE CALCIUM,
Washington Univ., Seattle. Coll. of Fisheries.
P. R. Olson.
Available from the National Technical Information Service as RLO-2225-T-7-4, $3.00 in paper copy, $0.95 in microfiche. Report Nos. CONF-710501-29; TID-4500 (57th Ed.), May 10-12, 1971. 30 p, 7 fig, 2 tab, 21 ref. ASC Contract AT (45-1)-2225-T7.

Descriptors: *Absorption, *Fish eggs, *Hatching, *Water pollution effects, Bioassay, Salmon, Sodium, Fertilization, Calcium chloride, Potassium, Radioactivity effects, Environmental effects, Calcium, Incubation, Fertility, Embryonic growth stage, Fresh water, Cytological studies, Toxicity, Magnesium, Magnesium compounds, Laboratory tests, Test procedures, Mortality, Nitrogen compounds, Radioactivity, Irradiation, Salmonids.
Identifiers: *Coho salmon, Ossification, Oncorhynchus kisutch, Clupea pallasii, Oncorhynchus keta, Salmo salar, Salmo trutta, Calcium radioisotopes, Cations.

Coho salmon eggs were fertilized and reared in tap water with calcium concentrations of 6 to 76 mg/liter to study the effect of this cation on embryo development and hatching. The eggs were prepared and incubated in sixteen 18-liter cylindrical pyrex jars, one containing flowing hatchery water and five sets of jars in triplicate for the various calcium concentrations. Calcium-45 was added to twelve jars; stable calcium (CaCl) was added to the remaining jars. The results showed that fertility of the eggs was improved in calcium concentrations above 6 ppm. Eggs in calcium concentrations of 76 ppm hatched two days earlier than those in solutions containing 6 ppm. The stable calcium concentration in all lots was similar, regardless of calcium concentrations in the solutions. A significant amount of calcium-45 entered the eggs during the water-hardening period, but only a slight amount was taken up during the 57 days to hatching. During the two week period after hatching, a tenfold increase in the uptake of calcium-45 was noted, which was associated with ossification. Discussion is also included on the concentration of stable calcium, magnesium, sodium, and potassium in the fry of different species of fish. (Synder-Battelle)
W72-09125

SECRETION OF DISSOLVED ORGANIC CARBON AND NITROGEN BY AQUATIC MACROPHYTES,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
R. G. Wetzel, and B. A. Manny.
Available from the National Technical Information Service as COO-1599-42, $3.00 in paper copy, $0.95 in microfiche. 1971. 22 p, 9 fig, 2 tab, 10 ref.

Descriptors: *Nutrients, *Michigan, *Metabolism, *Aquatic plants, Nitrogen, Eutrophication, Lakes, Phytoplankton, Plankton, Aquatic life, Bacteria, Littoral, Ultraviolet radiation, Cultures, Photosynthesis, Radioisotopes, Carbon dioxide, Carbon radioisotopes, Equipment, Hardness (Water), Spectrophotometry, Oxidation, Radioactivity techniques, Nitrates, Nitrites, Ammonia, Bioassay, Organic matter, Absorption, Analytical techniques, Diurnal, Nocturnal.
Identifiers: *Dissolved organic carbon, *Dissolved organic nitrogen, Macrophytes, Najas flexilis, Lemna perpnisilla, Liquid scintillation, Radioassay, Lake Lawrence, Infrared CO2 analyzer.

The dissolved organic carbon (DOC) and nitrogen (DON) components of dissolved organic matter (DOM) secreted by a submerged (Najas flexilis) and a floating-leaved (Lemna perpusilla) macrophyte have been studied and compared with estimates of allochthonous sources entering Lake Lawrence, a hardwater lake in Michigan. The macrophytes maintained in culture at 25 degree C with a 16 hour light-8 hour dark cycle were transferred to experimental media 16 hours prior to the initiation of growth measurements using labelled carbon either as carbonic acid or CO2. C-14 fixation was determined by the Van Slyke oxidation of lypholized tissue to CO2 and a gas-phase radioassay or by heat oxidation to CO2 and a liquid scintillation assay. Secreted organic carbon and total DOC were determined by persulfate oxidation to CO2 in sealed ampoules. The labeled CO2 was radioassayed in gas-phase; total DOC was determined as CO2 in an infrared CO2 analyzer. DON compounds were analyzed by high intensity ultraviolet combustion in combination with sensitive spectrophotometric nitrate-, nitrite-, and ammonia-nitrogen analyses. Rates of DOC secretion by Najas flexilis based on C-fixation were twice as high in organically buffered media as in bicarbonate buffered media. All DOC and DON secreted were 95-98 percent labile. The C/N ratio (11.4) of secreted organic matter for total DOC and DON was used to estimate the DOC and DON produced by submerged littoral flora of Lawrence Lake. Secretion by Lemna perpusilla was low for each carbon source, but was very rapid in aqueous HCO3 as compared to atmospheric CO2. The DOC secreted by Lemna contained more UV-refractory organic compounds and decomposed more slowly than that secreted by Najas. (Jefferis-Battelle)
W72-09127

SENSITIVITY OF STRIPED BASS AND STICKLEBACK TO AMMONIA IN RELATION TO TEMPERATURE AND SALINITY,
California State Dept. of Fish and Game, Sacramento.
Charles R. Hazel, Walter Thomsen, and Stephen J. Meith.
Calif Fish Game. 57 (3): 138-153. 1971.
Identifiers: Ammonia, Bass, Gasterosteus-Aculeatus, Median, Morone-Saxatilis, Relation, Salinity, Sensitivity, Stickleback, Striped, Temperature, Tolerance.

Toxicity of undissociated NH4OH to striped bass (Morone saxatilis) and stickleback (Gasterosteus aculeatus) was determined by static bioassay at 15C and 23C in fresh water, 33% seawater, and seawater. The 96-hr median tolerance limits (TLm) of striped bass in mg/liter NH4OH were as follows: at 15C--fresh water 2.8, brackish water 2.8, and seawater 2.0; at 23C--fresh water 1.9, brackish water 2.1, and seawater 1.5. The 96-hr TLm of sticklebacks were: at 15C--fesh water 2.1, brackish water 5.2, and seawater 10.4; at 23C--fresh water 1.8, brackish water 2.4, and seawater 2.3. The influence of salinity and temperature on the toxicity of undissociated ammonia was less for striped bass than for sticklebacks; or, sticklebacks were more resistant to ammonia poisoning at the higher salinities and the lower temperature. Striped bass were slightly more tolerant in brackish water than in fresh water or seawater.--Copyright 1971, Biological Abstracts, Inc.
W72-09133

MASSIVE DEATHS OF FISH IN NATURAL RESERVOIRS CONTAMINATED WITH INDUSTRIAL WASTES, (IN POLISH),
Wyzsza Szkola Rolnicza, Wroclaw (Poland).
Zbigniew Jara.
Med Wet. 26 (3): 131-136. 1970. Map. English summary.
Identifiers: Anhydrase, Carbonic, Contaminated, Deaths, Fish, Industrial, Massive, Natural, Reservoirs, Wastes.

Three cases of massive deaths of fish due to water contaminated by mine glass works and starchworks were reported. In the first case about 34 tons of fish died as a result of the covering of their gills and mucous membrane of mouth by a mild mineral suspension. In the second case about 0.5 ton of trout died due to great lowering of water pH caused by industrial wastes containing sulfuric and hydrofluoric acids from a glass works. In the third case the deaths of 7.0 tons of fish were caused by O2 deficiency. It was related to the decay of large amounts of carbohydrates on the bottom of the lake (under the ice). The carbohydrates were derived from a starch-works situated far away. The death of fish was probably caused by acidification of their body fluids and intoxication of some vital enzymes (including carbonic anhydrase).--Copyright 1971, Biological Abstracts, Inc.
W72-09134

A HISTORY OF THE LAKE-WEED INFESTATION OF THE ROTORUA LAKES AND THE LAKES OF THE WAIRATA HYDRO-ELECTRIC SYSTEM,
Auckland Univ. (New Zealand).
For primary bibliographic entry see Field 04A.
W72-09135

THE KALFLACH AND ITS WATER (A CONTRIBUTION TO THE ECO-PHYTOSOCIOLOGY OF EUTROPHIC WATERS OF THE LOWER RHINE RIVER),
Jochen Hild, and Kurt Rehnelt.
Vegetatio. 21 (4-6): 255-276. 1970. Maps.
Identifiers: Cladophora, Eutrophic, Glyceria-Maxima-M, Hottonia-D, Kalflach, Macrophytes, Myriophyllum-D, Nuphar-D, Phragmites-M, Phytosociology, Pollution, Rhine, River, Scirpus-M, Spirogyra.

The Kalflach is an old meander of the Rhine, still more or less directly connected. Its ecologically effective factors and their influence on the vegetation were investigated. As in other eutrophic Rhine cutoffs, Glyceria maxima stands dominate. The Scirpeto-Phragmitetum occurs and also varies with substrate and water depth. The water-plant vegetation is in part markedly different from that in neighboring waters of similar type. Forms of flowing water dominate. Myriophylleto-Nupharetum is well-developed. The Hottonietum palustris and an algal community new for the lower Rhine Spirogyro-Cladophoretum) are noteworthy. The waters of the Kalflach are influenced by variations in the level of the Rhine, both in relation to sedimentation and also to plant groupings, kinds of vegetation. Variations in precipitation have hardly noticeable effects. The steepness of the shores is decisive in determining the makeup of the shore plant communities. Chemical analyses show the small effects of sewage pollution.--Copyright 1971, Biological Abstracts, Inc.
W72-09138

5D. Waste Treatment Processes

CONTINUOUS THICKENING OF NON-IDEAL SUSPENSIONS,
Illinois Univ., Urbana. Water Resources Center.
R. I. Dick, and A. R. Javaheri.
Available from the National Technical Information Service as PB-209 531. Illinois Water Resources Center, Research Report No 45, 1972. 74 p, 23 fig, 18 ref. OWRR A-048-ILL (1).

Descriptors: *Sedimentation, *Activated sludge, *Water treatment, *Suspension, *Sludge treatment, Sludge disposal, Sludge, *Waste water treatment.
Identifiers: *Thickening, *Water softening sludge.

The steady state continuous thickening of non-ideal suspensions such as sludges from water and wastewater treatment plants was investigated. Suspensions of high grade calcium carbonate, activated sludges, water softening sludges, and

suspensions of fine glass beads were used. The suspensions were thickened in a closed, continuous, pilot, thickening system. The solids flux theory was used successfully for predicting performance of the steady state continuous thickener from batch settling velocities of the suspensions. For the optimal performance of the thickener, effective stirring of concentration layers near the underflow level was an absolute necessity. This prevented dilute solids from reaching the thickener bottom. Homogeneous distribution of the feed over the area of the tank was also essential. The feed concentration generally did not affect the thickening function. However, the interaction between thickening and clarification functions of the tank was established through the magnitude of feed concentrations. As the feed concentration decreased with fixed solids loading, the overflow velocity increased, and the clarity of overflow generally deteriorated.
W72-08587

NEW WASTEWATER TREATMENT PROCESSES - EPA ENCOURAGES ADOPTION,
Environmental Protection Agency, Washington, D.C. Office of Water Programs.
C. L. Swanson.
Civil Engineering - ASCE, Vol. 41, No. 9, p. 49-54, Sept. 1971. 7 fig, 5 tab.

Descriptors: Water treatment, Sanitary engineering, *Sewage treatment, *Wastewater disposal, *Research and development, Design, *Planning, Filtration, Trace elements, *Waste Water treatment.

The Environmental Protection Agency is encouraging the adoption of new technology by wastewater treatment plants. High-purity oxygen can be used in the activated sludge process. Processes are available for suspended solids removal and phosphorus removal. The technology for nitrogen removal is not as well developed as other advanced processes. Granular carbon treatment is done by contacting water with a fixed bed of carbon. Physical-chemical treatment is now a viable alternative to biological treatment processes. EPA has issued a series of process design manuals to provide information on new treatment technology. (Bean-AWWARF)
W72-08617

FILTRATION3 1. THE SIGNIFICANCE OF THEORY,
University Coll., London (England).
K. J. Ives.
Journal of the Institution of Water Engineers, Vol. 25, No. 1, p 13-20, February 1971. 6 fig, 13 ref.

Descriptors: *Water treatment, Sanitary engineering, *Filtration, *Design, *Theoretical analysis, *Model studies, Pilot plants.

Due to the complexity of particle and fluid motions in filter pores, and the fact that natural waters vary greatly in quality, no theory can be developed to predict exactly filter behavior. However, some useful roles can be performed by filter theory: (a) Theory indicates that certain measurements can be useful in operation or design; (b) Theory allows extrapolation of observed data; (c) Theory allows rational development of experimental models. (d) Theory shows that new or alternate designs are useful; (e) Theory gives a mathematical model of filter behavior which allows optimization studies to proceed. (See also W72-08619) (Bean-AWWARF)
W72-08618

FILTRATION: 2. EXPERIMENTAL DEVELOPMENTS,
Water Research Association, Marlow (England).
D. G. Miller.
Journal of the Institution of Water Engineers, Vol. 25, No. 1, p 21-30, February 1971. 5 fig, 1 tab, 14 ref.

Descriptors: *Water treatment, *Water quality, Sanitary engineering, *Filtration, *Design, Model studies, Electrolytes, Head loss, Costs, Turbidity, Cleaning, Filters.
Identifiers: *Multi media filters, Backwashing.

Incentives for change in filtration arise mainly from a desire to contain or reduce treatment costs, and also to improve the filtrate quality. Factors which tend to discourage departures from established practice include fears of quality deterioration, which may arise when using systems which have not had the test of time. Additionally, there is the question of the future quality of raw water sources, and the ability of newer processes, or even existing ones, to maintain potable water quality when these changes occur. Many of the process developments suggested produce a more sensitive but economic system, and this leads to the question of how far the need for increased control can be equated to the potential financial savings. Developments in slow sand filters and rapid gravity systems, filtration costs, trends in experimental developments, the importance of deposit characteristics, filtration systems, anthracite-sand filters, multi-layer systems, upflow filters, radial-flow filtration, turbidity monitoring, backwashing, and sludge disposal are discussed. (See also W72-08618) (Bean-AWWARF)
W72-08619

TERTIARY TREATMENT OF WEAK AMMONIA LIQUOR,
International Hydronics Corp., Princeton, N.J.
W. G. Cousins, and A. B. Mindler.
Journal Water Pollution Control Federation, Vol 44, No 4, April 1972, p 607-618, 9 fig, 3 tab, 2 ref. Presented at Water Pollution Control Federation Conference, 43rd, Boston, Massachusetts, Oct 4-9, 1970.

Descriptors: *Ion exchange, *Resins, *Ammonia, Separation techniques, Neutralization, Lime, Sludge, Colloids, Coagulation, Color, Turbidity, Adsorption, Distillation, Pilot plants, Chlorination, *Waste water treatment, *Tertiary treatment.
Identifiers: *Cyanides, *Thiocyanate, *Weak ammonia liquor.

The production of coke and its associated by-products also involves the production of weak ammonia liquor (WAL) containing ammonia, thiocyanate, cyanide, organic material, and color. Deammoniation has been indicated as the key phase in treating WAL with subsequent treatment for other waste components dependent on, or facilitated by, removal of ammonia. Pilot scale investigations into ion exchange treatment for WAL demonstrated that: (1) deammoniation of raw WAL by hydrogen ion exchange is impractical because of fouling; (2) deammoniation of biodegraded WAL by hydrogen ion exchange is technically but not economically feasible; (3) hydrogen ion exchange of biodegraded WAL results in coagulation and removal of colloidal biodegradation products and their associated color and COD. In a process consisting of hydrogen ion replacement of ammonia followed by two column counter current adsorption and elution recovery of ammonium sulfate, 96% ammonia removals, 90% thiocyanate removals, and reductions in turbidity and color were achieved with no resin deterioration. Coagulation reduced residual cyanide from 5 mg/l to .2 mg/l. However, further cost reductions are necessary before the process can be widely applied. (Lowry-Texas)
W72-08674

CHEMICAL BIOLOGICAL TREATMENT OF A CREOSOTE WASTE FROM THE WOOD PRESERVING INDUSTRY,
Mississippi State Univ., State College.
N. R. Francinques., Jr.
Master's Thesis, January 1971, 92 p, 28 fig, 8 tab, 34 ref.

Descriptors: *Chemical wastes, *Lime, *Polyelectrolytes, Flocculation, Sedimentation, Trickling filters, Biochemical oxygen demand, Chemical oxygen demand, Phenol, Design criteria, Sludge disposal, Dewatering, Data processing, *Waste water treatment, *Biological treatment.
Identifiers: Combined treatment.

The chemical preservation of wood products produces effluent wastewaters containing large amounts of pollutants (BOD, COD, phenols, and oil). A trickling filter pilot plant was operated on a creosote waste to evaluate the feasibility of chemical biological treatment of such wastewaters from the wood preserving industry. Optimization of chemical dosages and performance of the biological system were measured by the following parameters: BOD, COD, phenol, oil, pH, and temperature. Lime plus polyelectrolyte, in the amounts of 2.0 g/l and 15 mg/l respectively, provided the most effective means of chemical coagulation. Proposed design charts were developed for influent BOD and COD loadings versus percent BOD and COD removals at 20 degrees C with recycle ratios of 28:1, 14:1, and 7:1. Sludge produced averaged 5% of the original volume, and on gravity dewatering, contained 25% total solids with approximately 27% volatile solids. From these indications, it was apparent that the batch flocculation-sedimentation system followed by trickling filtration provided a feasible means of reducing COD, BOD, and phenol. (Lowry-Texas)
W72-08675

THE ENGINEERING EVALUATION OF REVERSE OSMOSIS AS A METHOD OF PROCESSING SPENT LIQUORS OF THE PULP AND PAPER INDUSTRY,
Sulphite Pulp Manufacturers Research League, Appleton, Wis.
A. C. F. Amerlaan, and A. J. Wiley.
Chemical Engineering Progress Symposium Series No. 97, Vol 65, 1969, p 148-155, 2 fig, 2 tab, 3 ref.

Descriptors: *Pulp wastes, *Sulfite liquors, *Reverse osmosis, Separation techniques, Pilot plants, Design criteria, Membrane processes, Pressure, Permeability, Detergents, Cost analysis, Evaporation, Pulp and paper industry, *Waste water treatment, Liquid wastes, Industrial wastes, *Effluents.
Identifiers: *Flux, *Rejection.

A trailer mounted reverse osmosis pilot plant was designed, constructed, and operated on pulp mill effluents at 6 different mill sites. The 50,000 to 100,000 gal/day unit was designed to process dilute effluents requiring a ten to twenty fold increase in concentration of the original feed liquor. Field operation demonstrated that while the reverse osmosis technique was feasible for use in concentrating dilute mill effluents, methods would have to be developed to combat fouling and scale. Assumption of a 2 year minimum membrane life and moderate but realistic costs for materials and labor for replacing membranes indicated that reverse osmosis would be several times less expensive than evaporation for the removal of water from dilute pulp mill effluents. (Lowry-Texas)
W72-08676

IMPROVEMENTS TO THE QUALITY OF WASTEWATER FROM HUMBLE'S BATON ROUGE REFINERY,
Humble Oil and Refining Co., Baton Rouge, La.
R. T. Denbo.
Chemical Engineering Progress Symposium Series, No. 97, Vol. 65, 1969, p 259-264, 14 fig.

Descriptors: *Oil wastes, *Phenol, Water quality control, Cooling towers, Water reuse, Separation techniques, Emulsions, Tastes, Odors, Planning, Cost analysis, Industrial water, Industrial wastes, *Waste water treatment, *Louisiana.
Identifiers: *Baton Rouge (La).

Since construction in 1909, the crude run of the Baton Rouge Refinery has increased from 2000 to over 400,000 barrels/day in 1969. However, increasing recirculation of water is being practiced, to the extent that only 30% of daily plant water usage is supplied by water drawn from the Mississippi River. However, river water accounts for 90% of the total of 190,000,000 to 200,000,000 gallons of wastewater discharged daily. During the period 1959 to 1969, approximately $6,000,000 was expended to build: (1) a silt treatment plant; (2) ballast handling facilities; (3) improved API separators; (4) a phenex unit, for phenol separation by liquid-liquid extraction; (5) a mercapfiner, a fixed bed catalyst for odor reduction; and (6) a sour water stripper. Future plans include construction of biological secondary treatment facilities; reduction of waste loading at the source, and pretreatment for toxic materials, as well as a system for holding storm water runoff. These improvements are projected to effect a 90% reduction of wastewater, 95% reductions of phenols and oils, and 92% reduction of BOD. Total cost of the overall system is projected at $30,000,000, and tentative completion date is 1973. (Lowry-Texas)
W72-08677

THE UTILITY OF OPTICAL PARAMETERS IN EVALUATION OF PROCESSES OF FLOCCULATION AND SEDIMENTATION,
Dow Chemical Co., Midland, Mich.
S. L. Daniels.
Chemical Engineering Progress Symposium Series No. 97, Vol 65, 1969, p 171-176, 9 fig, 16 ref.

Descriptors: *Coagulation, *Flocculation, *Sedimentation, Analytical techniques, Research and development, Separation techniques, Optical properties, Colloids, Water treatment, *Waste water treatment.
Identifiers: *Transmittance.

The four subjective criteria most often used to evaluate flocculation and sedimentation processes in batch experiments are: (1) rate of flocculation; (2) size of resultant floc; (3) sedimentation rate; and (4) supernatant clarity. However, logarithmic normal distribution functions are widely used to describe the distribution of sizes in populations of crystals, aerosols, sieved particles, and gas and liquid dispersions. Certain optically defined parameters of flocculation, denoted as P1, can also be related to the flocculation concentration F by the use of logarithmic normal distribution functions. Any two optical parameters of flocculation can then be expressed as functions of each other and a flocculation activity diagram can then be constructed. Two dependent parameters which have been so related are the degree of flocculation Pi = eF, and the initial rate of flocculation, P2 = rF. In addition, two independent parameters, the concentrations of flocculant and flocculate, have been related in flocculation contour diagrams. These diagrams may then be used in three areas: (1) investigation of flocculation mechanisms; (2) evaluation of flocculant activity; and (3) description and control of flocculation processes. (Lowry-Texas)
W72-08678

THE MECHANISM OF COAGULATION OF WASTE FROM A SYNTHETIC RUBBER PLANT,
Hercules Inc., Houston, Tex.
P. A. Witt, Jr., and J. A. Scher.
Chemical Engineering Progress Symposium Series No. 97, Vol 65, 1969, p 167-170, 2 fig, 3 tab, 7 ref.

Descriptors: *Chemical wastes, *Coagulation, *Oxidation, Pilot plants, Sampling, Flow rates, Aeration, Mixing, Sedimentation, Dissolved oxygen, Hydrogen ion concentration, Industrial wastes, *Waste water treatment, *Synthetic rubber, Water pollution sources.
Identifiers: *Carbon black, *Butadiene-styrene monomers.

Waste water characterization studies, using a gas-liquid chromatograph and a carbon analyzer, indicated that the major waste constituents of a synthetic rubber manufacturing plant were carbon black and butadiene-styrene monomers. The average BOD over two months of testing was 185 mg/l. A ten-liter bench scale tank was used to establish the feasibility of biological oxidation of the effluent, but further testing of a bench-scale continuous bio-oxidation unit indicated that while the soluble organic carbon content of the wastes was being reduced, no uniform results could be obtained on the rate of oxygen consumption. Oxygen uptake studies confirmed the fact that oxygen consumption was considerably less than the BOD reduction. Plant-scale coagulation trials of three systems using different aeration-agitation devices were then conducted. The optimum system utilized a 1 1/2 in. diameter spray nozzle to saturate the liquid with oxygen (at 104 deg. F) and to cool the mixture an average of 10 deg., promoting coagulation. BOD was reduced from 174 to 32 mg/l by this method, and since compressed air was not used, decreased initial capital expenditure and daily operating costs were realized. (Lowry-Texas)
W72-08679

TREATMENT OF LAUNDROMAT WASTES--PART II OPERATION OF A DIATOMACEOUS EARTH FILTRATION SYSTEM FOR PURIFICATION OF COIN-OP LAUNDROMAT WASTE,
Rensselaer Polytechnic Inst., Troy, N.Y.
D. B. Aulenbach, M. Chilson, and P. C. Town.
Preprint, presented at Industrial Wastes Conference, 26th, May 4-6, 1971, 35 p, 7 fig, 14 tab, 4 ref.

Descriptors: *Domestic wastes, *Laundering, *Chemical precipitation, *Filtration, Design criteria, Turbidity, Biochemical oxygen demand, Chemical oxygen demand, Phosphates, Alkalinity, Hardness (Water), Cost analysis, Calcium chloride, Diatomaceous earth, Hydrogen ion concentration, *Waste water treatment.
Identifiers: American Laundry Machinery Industries.

Waste treatment facilities for laundry wastes must satisfy the following criteria: (1) provision of an effluent acceptable to health regulations; (2) ability to handle peak loads as well as normal demands; (3) minimal service and operational maintenance skills and time; (4) ease of disassembly, transporting, and reassembly; (5) minimum space requirements; (6) economics; and (7) recycle the treated water whenever possible. The American Laundry Machinery Industries (ALMI) wastewater treatment system, consisting of a mixing tank, two chemical feed tanks, two pressure filtration units, and the appropriate pumps, piping, and valves, was investigated as to its ability to meet the above criteria. System operation consists of applying a 45 lb charge of diatomaceous earth pre-coat on the filter elements, pumping 400 gallons of wastewater through each filter, removing the pre-coat by a mechanical 'bump', and repeating the pre-coat and filtration cycles. Under optimum operating conditions, the system achieved reductions of 98, 94, 70, and 84% for ABS, PO4, BOD, and COD respectively. Coliforms are also effectively removed, and the effluent exhibits a low turbidity, despite the fact that the treatment results in an increase in total dissolved solids and slight increase in alkalinity. Total cost was estimated at $15/day or 6 cents/wash. (Lowry-Texas)
W72-08680

FUNDAMENTALS OF ODOR CONTROL,
Iowa Univ., Iowa City. Dept. of Civil Engineering.
R. R. Dague.
Journal Water Pollution Control Federation, Vol 44, No. 4, April 1972, p 583-594, 2 fig, 3 tab, 39 ref.
Presented at Great Plains Wastewater Design Conference, 15th, Omaha, Nebraska, March 23, 1971.

Descriptors: *Odors, *Waste water treatment, *Hydrogen sulfide, *Sulfides, Chemical precipitation, Oxidation-reduction potential, Chlorination, Disinfection, Oxidation, Hydrogen ion concentration, Temperature, Aeration, Slime, Sludge, Ammonia, Topography, Climatic zones, Water pollution sources, *Air pollution.
Identifiers: *Mercaptans, *Odor control.

The primary sources of odor from wastewater treatment plants include such inorganic gases as ammonia and hydrogen sulfide, and such organic gases as mercaptans, indoles, skatoles, and various other nitrogen and sulfur-bearing organics. However, H2S far outranks the other compounds as the major odor producer, although the conditions that produce H2S also favor production of odorous organic compounds. The reduction of sulfate ion is the most significant mechanism of H2S production, and sulfate reducing bacteria require a -200 to -300 mv ORP, a pH in the range of 6-9, and temperatures near 30 deg. C, to thrive. Methods of odor control include chlorination, aeration, addition of metal ions to precipitate sulfides, use of oxidants other than chlorine, nitrates and oxygen, counteraction and masking, and combustion. Topography and climate conditions should also be evaluated when designing new treatment plants, to determine whether serious odor problems are likely to result. Many odor control methods currently exist, but an understanding of the problem is essential in selecting the method or methods to be used. (Lowry-Texas)
W72-08681

SOIL FILTRATION OF WASTEWATER EFFLUENT AND THE MECHANISM OF PORE CLOGGING,
British Columbia Univ., Vancouver. Dept. of Soil Science.
J. De Vries.
Journal Water Pollution Control Federation, Vol 44, No. 4, April 1972, p 565-573, 8 fig, 1 tab, 9 ref.

Descriptors: *Soil filters, *Porous media, Particle size, Particle shape, Sands, Separation techniques, Temperature, Hydrogen ion concentration, Carbon dioxide, Dissolved oxygen, Oxidation, Biochemical oxygen demand, *Phosphates, *Nitrates, *Filtration, *Waste water treatment.
Identifiers: *Pore clogging.

Two laboratory scale wastewater renovation columns were subjected to daily applications of room temperature wastewater for 240 days at a rate of 20 cm/day, 5 days/wk, with an application period of 2 hours. The filters were drained during the rest periods and both CO2 and O2 measurements at various layers within the beds indicated that the filters were working well, but also that the rest period between applications should be at least 22 hours. Applications of 4 deg. C effluent at the same rate produced filter failure in 10 days due to pore clogging. Surface sludge deposits were clearly visible. CO2 and O2 measurements showed that, at room temperature, the failed filters recovered in about 8 days. The fine sand filter, using sand grains coated with Fe2O3 and Al2O3, produced nearly 100% renovation of wastewater effluent with respect to BOD and phosphates. Treatment with medium Ottawa sand, however, resulted in only partial renovation with respect to BOD and phosphate. Treatment with both sand fractions resulted in about 25% nitrate reductions. (Lowry-Texas)
W72-08684

CHEMICAL-PHYSICAL TREATMENT OF MUNICIPAL WASTEWATER USING CONTINUOUS COUNTERCURRENT FILTRATION,
Johns-Manville Products Corp., Manville, N.J. Celite Div.
D. V. Libby, G. R. Bell, and O. A. Wirsig.
Journal Water Pollution Control Federation, Vol 44, No. 4, April 1972, p 574-582, 2 fig, 8 tab, 6 ref.
EPA 14-12-154.

Descriptors: *Coagulation, *Filtration, *Separation techniques, Polyelectrolytes, Biochemical oxygen demand, Suspended solids, Hydrogen ion concentration, Turbidity, Alkalinity, Phosphorus, Colloids, Pilot plants, Cost analysis, Trickling filters, *Waste water treatment, Domestic wastes.
Identifiers: *Counter current flows, *Alum, *Combined treatment.

Raw wastewater, primary effluent, and secondary effluent from a trickling filter were successfully treated in a pilot scale plant using continuous counter current filtration through a moving sand bed. Flow rate through the pilot plant was 8 gpm. Alum and polyelectrolyte were added before filtration to promote coagulation and act as a filter conditioner. Alum doses of 200 mg/l and polyelectrolyte doses of 0.2 to 0.5 mg/l were commonly used. Both influent and effluent were sampled and analyzed for BOD, alkalinity, suspended and volatile solids, turbidity, pH, and phosphorus. In treating unchlorinated final effluent, the process reduced average effluent levels to 12 mg/l BOD, 15 mg/l TSS, and 0.51 mg/l TP. Treatment of primary effluent produced average residual values of 12 mg/l BOD, 11 mg/l TSS, and 1.13 mg/l TP. For raw wastewater, average BOD levels were reduced from 115 mg/l to 19 mg/l, TSS from 156 mg/l to 27 mg/l, and TP from 21.5 mg/l to 2.16 mg/l. Capital costs of a 1.0 mgd chemical-physical treatment plant were estimated at $440,000, while occupying 1.0 acres. By comparison, a similarly sized trickling filter plant would cost $475,000 and occupy 3.0 acres. Operating costs for the 1.0 mgd chemical-physical system were estimated at $0.071/1000 gal without amortization. (Lowry-Texas)
W72-08685

A SOLUTION TO THE PHENOLIC POLLUTION PROBLEM IN FIBER GLASS PLANTS: A PROGRESS REPORT,
Johns-Manville Research Center, Manville, N.J.
J. M. Baloga, F. B. Hutto, Jr., and E. I. Merrill.
Chemical Engineering Progress Symposium Series, No. 97, Vol 65, 1969, p 124-127, 6 fig.

Descriptors: *Phenols, *Filtration, *Water reuse, Industrial water, Industrial wastes, Diatomaceous earth, Resins, Aeration, Operating costs, Cost analysis, *Waste water treatment.
Identifiers: *Fiber glass plants, *Diatomite filtration.

Production of fiber glass materials involves spraying of the product with a phenolic resin while the product is on a conveyor belt. High pressure water streams are then used to clean the belts, and a phenolic wastewater is produced. The water cycle of one machine in a fiber glass plant was closed, and the phenolic effluent was treated using a Delpark primary filter, a pressure diatomite filter, and fiber glass cartridge filter tubes. Operation of the pilot plant demonstrated that polymerization occurred, necessitating elevation of the pH to 8.5 to 10.0. The pilot plant then was operated successfully for 2 months and full scale design criteria were obtained. Results have demonstrated that: (1) reuse of phenolic resin containing wastewaters is feasible; (2) receiving stream water quality has improved dramatically; (3) plant water usage has been reduced by more than 50%; (4) diatomite filtration provided water of excellent quality; (5) product quality was not affected by using filtered process water in binder make-up; and (6) the high level of phenolic resin in the recirculated water has led to a reduction in binder usage at a net operational cost savings of $2700/month over a 4 month period. (Lowry-Texas)
W72-08687

PROGRESS REPORT ON THE CONTINUOUS ION EXCHANGE PROCESS,
Graver Water Conditioning Co., Union, N.J.
J. A. Levendusky.
Chemical Engineering Progress Symposium Series No. 97, Vol. 65, 1969, p 113-123, 7 fig, 1 tab, 13 ref.

Descriptors: *Ion exchange, *Resins, *Industrial wastes, Operation and maintenance, Cation exchange, Anion exchange, Monitoring, Flow rates, Flexibility, Automatic control, Cost analysis, Water purification, *Waste water treatment.
Identifiers: *Countercurrent flow, Process control, Exhaustion, Regeneration, Rinsing.

A new ion exchange process scheme has been developed. Until now, the method of ion exchange involved packed bed downflow schematics with exhaustion and regeneration in the same vessel. The Graver process, however, separates the functions of exhaustion, regeneration, and rinsing into three separate vessels, with the result that now each of the three functions may be optimized individually. In addition, contacting the waters to be treated with counter current flows of adsorbent allows the most efficient utilization of all the regenerant while at the same time making the process more amenable to automation. In addition, space reductions of up to 50% can be achieved because of lower resin inventories, higher flow rates, and continuous exhaustion and regeneration of the resin. Effluent quality control is extremely flexible, and regenerant waste disposal volumes are minimized due to the more efficient use of regeneration chemicals and mode of operation of the desorption towers. These factors combine to make ion exchange by the Graver C. I. process economically feasible where ion exchange by the fixed bed process was totally impractical. (Lowry-Texas)
W72-08689

BIOLOGICAL UTILIZATION OF POLYMERS,
Texas A and M Univ., College Station.
R. L. Irvine, Jr., A. D. Elbein, and A. W. Busch.
Chemical Engineering Progress Symposium Series, No. 97, Vol 65, 1969, p 177-187, 13 fig, 37 ref.

Descriptors: *Polymers, *Biodegradation, *Enzymes, Hydrolysis, Ultrasonics, Laboratory tests, Analytical techniques, *Waste water treatment, E. coli, Biological treatment.
Identifiers: Disruption, *Reaction rates, Lactose, Glucose.

Since many high molecular weight polymers cannot penetrate the cell membrane of bacteria, extracellular hydrolytic cleavage of such polymers is necessary before biological removal can occur. The rate of hydrolysis is then recognized as the rate limiting step, and one method of increasing the rate of hydrolysis is to increase the concentration of hydrolytic enzymes in contact with the polymer. Theoretically, such an increase could be produced by artificial disruption of a fraction of the biomass. An Escherichia coli-lactose system was investigated in a batch reactor to determine the effects of such artificial disruptions, both experimentally and theoretically. Conclusions were: (1) lactose, in the presence of the ML35 strain of E. coli and beta-GAse, exhibited properties characteristic of a polymer; (2) optimum rate of biological removal was achieved by artificially disrupting 84% of the organisms; (3) the biological removal rate of any polymer can be increased if, and only if, the proper criteria are satisfied; and (4) a mixed culture would probably be more effective in the removal of soluble carbon than a pure culture. (Lowry-Texas)
W72-08690

AIR FLOTATION PURIFIES WASTEWATER FROM LATEX POLYMER MANUFACTURE,
Permutit Co., Paramus, N.J.
J. Lundgren.
Chemical Engineering Progress Symposium Series No. 97, Vol 65, 1969, p 191-195, 5 fig, 2 tab.

Descriptors: *Industrial wastes, *Suspended solids, *Flotation, Coagulation, Separation techniques, Aeration, Turbidity, Hydrogen ion concentration, Odor, Cost analysis, *Waste water treatment, Waste disposal.
Identifiers: *Latex wastes.

Latex waste disposal has been complicated by the fact that it not only inhibits biological activity, but it also clogs pumps and pipelines, requiring expensive maintenance procedures. A series of laboratory and pilot plant studies have been conducted by the Permutit Corporation, and results have indicated that the chemical coagulation-dissolved air flotation is a feasible treatment system for latex wastes. Based on this data, a 200 gpm Colloidair flotation unit, coagulation tank, chemical preparation and feed system, and an automatic waste supply control system were designed and constructed as a cost of $250,000. Influent waste to the treatment plant had 0.4 to 0.8% solids, basic pH, milky color, and strong odor, whereas effluent from the plant contained 0.05-0.19% solids, near neutral pH, no color and only slight odor. Separated solids are pumped to an adjacent swamp and dewatered to about 15% through drainage and evaporation. If dewatered, polymer sludge is marketable at about 2-6 cents/lb, so when large quantities of waste are involved, the installation of dewatering equipment may be justifiable from a recovery standpoint. (Lowry-Texas)
W72-08691

MAKESHIFT GRANULAR CARBON SYSTEM RESOLVES PHENOL LAGOON POLLUTION THREAT,
Georgia-Pacific Corp., Portland, Oreg.
M. Gould, and J. Taylor.
Chemical Engineering Progress Symposium Series No. 97, Vol 65, 1969, p 196-199, 7 fig.

Descriptors: *Phenol, *Suspended solids, *Activated carbon, *Adsorption, Hydrogen ion concentration, Chemical precipitation, Chemical wastes, Lagoons, *Waste water treatment, Cleaning, *North Carolina, Waste disposal.
Identifiers: *Backwashing, *Sulfuric acid, *Conway (N.C.).

When overflow of two lagoons used to store phenol contaminated waters became imminent because of heavy rains in the area, a new phenol waste treatment scheme was proposed, researched, tested both in the laboratory and the field, and implemented on a temporary basis. The system consisted of 2 plastic lined lagoons of 8.5 mg capacity, a 15 ft. deep bed of Filtrasorb, backwash and regeneration systems, caustic storage for storing 50% caustic soda solution, a plastic lined clearwell, and a reactivation outlet line to the top of the adsorption column. Clarification prior to carbon treatment is accomplished in the two lagoons by the addition of sufficient sulfuric acid to depress the pH to 4.2. Laboratory tests indicated a reduction from 1400 ppm SS to 50 ppm SS, and field data confirmed these findings. The treatment system was successful in quickly lowering the levels of phenolic wastewater in the lagoons, removing the very real hazard of overflow into nearby surface water. A permanent installation, based on the laboratory and field operating experiences, is under study. (Lowry-Texas)
W72-08692

RADIATION TREATMENT OF INDUSTRIAL WASTEWATERS: ECONOMIC ANALYSIS,
AeroChem Research Labs., Inc., Princeton, N.J.
A. I. Mytelka.
Chemical Engineering Progress Symposium Series No. 97, Vol 65, 1969, p 246-250, 4 fig, 3 tab, 6 ref.

Descriptors: *Industrial wastes, *Radioactivity, *Oxidation, Cobalt, Biodegradation, Chemical reactions, Cost analysis, Economic feasibility, *Waste water treatment.
Identifiers: *Reaction rates, *Pretreatment, Technical feasibility, *Radiation treatment.

The economics of ionizing radiation, as a pretreatment method for increasing the biodegradability of industrial wastes, were investigated on a theoretical basis. A range of costs was assumed (cents/k gal), a plant to meet the preselected costs was designed and costed-out, and overall reaction rate

that would allow the use of radiation treatment to meed each cost was then calculated, and the calculated reaction rate was compared with reaction rates obtained in laboratory investigations. Results of this analysis, performed at cost estimations of 20,50, and 100 cents/k gal, indicated that overall oxidation reaction efficiencies must be increased by factors varying from 2 to 25 times those presently attainable if radiation treatment is to become economically feasible. Therefore, further intensive investigations into the reaction chemistry are necessary, before any large increases in reaction efficiency are possible. (Lowry-Texas)
W72-08695

SOME RECENT ADVANCES IN WATER TREATMENT TECHNOLOGY,
Neptune Microfloc, Inc., Corvallis, Oreg.
S. P. Hanse, G. H. Richardson, and A. Hsiung.
Chemical Engineering Progress Symposium Series No. 97, Vol 65, 1969, p 207-217, 16 fig, 2 tab, 7 ref.

Descriptors: *Sedimentation, *Filtration, *Separation techniques, Turbidity, Suspended solids, Coagulation, Flocculation, Polyelectrolytes, Cost analysis, *Water treatment, *Waste water treatment.
Identifiers: *Tube settlers, *Mixed media filtration, *Saskatchewan (Canada).

Both laboratory and pilot plant studies, as well as plant scale operating data have demonstrated the unique capabilities of the tube settler and the mixed media filter bed for achieving high water quality at a significant cost savings. Both low angle and steeply inclined tube settlers are currently in use, with the former requiring automatic draining during backwashing for sludge removal, and the latter achieving sludge removal without draining. Tube settlers now in operation have sedimentation times of less than ten minutes, with capacities ranging from 10 to 2,000 gal/min. The greatest advantage afforded by both mixed media filtration and tube clarifiers is their ability to be adapted to existing equipment and be installed without interruption of plant activities. The capacity of a 2.75 mgd water purification plant at the Buffalo Pound Plant of the City of Saskatchewan was expanded to 7.5 mgd at a cost of $15,000 by installing tube modules in existing clarifiers and converting sand filters to mixed media filters with no loss of produce quality. (Lowry-Texas)
W72-08697

A FOAM PROCESS FOR TREATMENT OF SOUR WATER,
New Mexico State Univ., University Park.
M. Bheda, and D. B. Wilson.
Chemical Engineering Progress Symposium Series No. 97, Vol 65, 1969, p 274-277, 3 fig, 4 tab, 14 ref.

Descriptors: *Hydrogen sulfide, *Foaming, *Surfactants, Separation techniques, Froth flotation, Bubbles, Laboratory tests, Cost analysis, Odors, *Waste water treatment.
Identifiers: *Stripping, *Sour water treatment.

A 3 in. by 3 in. by 5 ft. plexiglass column was constructed having 6 feed locations and 5 recycle locations, for the evaluation of different chemical reagents in the foam separation method of removing H2S from liquid waste. The chemicals tested included 1,4 naphthoquinone-2-sulfonic acid, sodium salt and 1, anthraquinone sulfonic acid, sodium salt, as well as sodium metavandate and propylurea. The foam processes were then compared economically with two processes currently being used for the treatment of sour water. Operation of the experiment at an air to feed ratio of 25 to 1, a foam height of 1.5 ft. and a liquid residence time of 20 minutes resulted in essentially complete hydrogen sulfide removals at a total cost of 12.0 mil/barrel. The greater operating cost for the foam process was the result of loss of surfactant in the raffinate. Approximately 20% recovery of the sulfide as sulfur results. Further development of the process is continuing. (Lowry-Texas)
W72-08698

THE REMOVAL OF PHOSPHATES FROM WASTEWATERS BY ELECTRODIALYSIS,
Rutgers - The State Univ., New Brunswick, N.J.
T. Helfgott, and J. V. Hunter.
Chemical Engineering Progress Symposium Series No. 97, Vol 65, 1969, p 218-231, 20 fig, 7 tab, 20 ref.

Descriptors: *Electrodialysis, *Phosphates, *Membrane processes, Semipermeable membranes, Separation techniques, Fouling, Activated carbon, Adsorption, Filtration, Chlorides, Hydrogen ion concentration, Temperature, Surfactants, Laboratory tests, Nitrate, Nutrients, *Waste water treatment.
Identifiers: *Flux, *Orthophosphates.

The most significant contribution of phosphates to natural waters comes from wastewater effluents, of which 91 to 100% are in the chemical form of orthophosphates. Effluent and phosphate have been linked to photosynthetic growth and growth rates suggesting the removal of phosphates as a logical step in avoiding algal blooms. Laboratory scale testing of the electrodialysis process was performed, and the results indicated: (1) phosphates are not removed as effectively by electrodialysis as are chlorides, because of the net charge of the ions at neutral and lower pH's and the electromobility of these ions; (2) phosphate-nitrate solutions behave more like sewage effluent than pure phosphate solutions; (3) pretreatment of secondary effluent by activated carbon for the prevention of fouling did not seem to be necessary under test conditions; (4) membrane capacity was at least partially recovered by electrically driving brine at high concentration across the membrane and reversing the polarity; and (5) reductions of phosphate to less than 1 mg/l were achieved. (Lowry-Texas)
W72-08699

RESPONSE AND STABILITY OF A COMPLETELY MIXED ACTIVATED SLUDGE REACTOR,
Connecticut Univ., Storrs.
H. E. Klei, D. W. Sundstrom, and A. E. Molvar.
Chemical Engineering Progress Symposium Series, No. 97, Vol 65, 1969, p 232-237, 10 fig, 7 ref.
FWPCA Grant WPD-175-01-67.

Descriptors: *Activated sludge, *Kinetics, *Mathematical models, Mixing, Optimization, Analytical techniques, *Waste water treatment, *Control systems.
Identifiers: *Monod reaction kinetics, Linearizing.

The non-linear and linearized responses of a well-mixed activated sludge reactor to step changes in feed flow rate, carbon concentration, and sludge concentration were examined. Based on Monod type kinetics for the disappearance of dissolved oxygen and the generation of sludge, material balances were made on the dissolved carbon and sludge flowing through the reactor. Linearization of the equations was then accomplished by replacing the non-linear terms by the appropriate multivariable Taylor Series expansion, truncated after the first-order term. Step changes in carbon feed, sludge concentration, and feed rate were then introduced, and kinetic constants and feed conditions were assumed so that computer solutions for the non-linear equations could be compared to the linearized solutions. Results demonstrated that linearized and non-linear responses agreed with 10% for input step disturbances up to plus or minus 30%. Thus, linear systems analysis can be applied to design controllers that should operate satisfactorily over a practical range of input fluctuations. Control system design can be simplified by using the linear process model, with a reactor stability analysis further indicating the region of stable operation to be very broad. (Lowry-Texas)
W72-08700

EVALUATION AND DESIGN OF AEROBIC DIGESTERS,
Ontario Water Resources Commission, Toronto.
N. R. Ahlberg, and B. I. Boyko.
Journal Water Pollution Control Federation, Vol 44, No. 4, April 1972, p 634-643, 5 fig, 5 tab.

Descriptors: *Aerobic digestion, *Digestion, *Sludge disposal, Flow rates, Aeration, Mixing, Design criteria, Temperature, Nutrients, Foaming, Activated sludge, *Waste water treatment, *Treatment facilities.
Identifiers: *Sludge age.

The validity of the commonly used design criteria for aerobic digestion installations was investigated at a full scale basis by evaluating 7 treatment plants in the Province of Ontario. Particular areas investigated included: (1) biological oxygen requirements; (2) methods of operation; (3) types of treatment plants preceding the aerobic digester; (4) the practical operating range for suspended solids; (5) supernatant quality; (6) digested sludge characteristics; (7) disposal methods following digestion; (8) volatile solids destruction; (9) seasonal operating problems; and (10) operational problems related to ether-soluble materials and metals. Conclusions obtained from the 18 month study included: (1) aerobic digestion can produce a stable sludge; (2) present air flow rates of 20 cfm/1000 ft3 are insufficient, and air flow rates of 50 cfm/1000 ft3 are necessary; (3) specific oxygen uptake rate, not volatile solids reduction, should be used as an indicator of sludge stabilization; and (4) to insure sludge stability, a two stage digestion system is required for all activated sludge processes except the extended aeration modification. (Lowry-Texas)
W72-08703

HYDRAULIC MODEL STUDIES OF CHLORINE CONTACT TANKS,
Illinois State Water Survey, Peoria.
V. Kothandaraman, and R. L. Evans.
Journal Water Pollution Control Federation, Vol 44, No. 4, April 1972, p 625-633, 7 fig, 4 tab, 14 ref.

Descriptors: *Chlorination, *Disinfection, *Prototype tests, Laboratory tests, Tracers, Dye releases, Baffles, Aeration, Sedimentation, Mixing, Sludge, Microorganisms, Hydrogen ion concentration, *Waste water treatment, Model studies, *Hydraulic models.
Identifiers: *Theoretical detention time, *Short-circuiting.

Chlorine contact tanks currently suffer the shortcomings of dead-space and short-circuiting, as well as accumulations of solids, all of which generate additional expense in the operation of chlorination facilities. To obtain more information about the process, the hydraulic characteristics of a rectangular model contact tank were studied using rhodamine-B dye under different flow conditions and comparing the experimental results by statistical methods. Results from the lab-scale experiments indicated that air-mixed, baffled flow has flow characteristics superior to those of baffled flow alone or air-mixed flow alone in chlorine contact chambers. In addition, mixing of the tank with air was demonstrated to bring microbes into intimate contact with the chlorine, thus affecting improved overall tank performance. Provision of mixing also eliminated sludge deposition problems by keeping the particles in suspension. Air agitation of the contact tank, at the pH and chlorine concentrations normally encountered in wastewater treatment plants, for 30 min. produced no detectable chlorine loss. (Lowry-Texas)
W72-08704

ANAEROBIC CONTROL OF PHOSPHATE BY FERROUS IRON,
Notre Dame Univ., Ind. Dept. of Civil Engineering.
P. C. Singer.
Journal, Water Pollution Control Federation, Vol 44, No. 4, April 1972, p 663-669, 5 fig, 2 tab, 19 ref.

Descriptors: *Chemical precipitation, *Phosphorus, *Iron compounds, Analytical techniques, Separation techniques, Filtration, X-

ray diffraction, Solubility, Saturation, Anaerobic conditions, Hydrogen ion concentration, *Waste water treatment, *Phosphates.

Solid ferrous phosphate was prepared by precipitation from solutions containing excess ferrous perchlorate and sodium di-hydrogen phosphate, and its solubility product was determined. The bluish-white sediment obtained was identified as ferrous phosphate using X-ray diffraction techniques. To determine the relevance of ferrous phosphate formation as a mechanism for the control of phosphate in anaerobic systems, samples of supernatant liquid were collected from: (a) South Bend and Mishawaka, Indiana, both cities having waters of relatively high calcium concentrations; (b) Pontiac, Michigan, where ferric iron was employed for phosphate removal before primary sedimentation; and (c) Benton Harbor, Michigan, where ferric iron had been used but was not in use at the time of the study. Results of tests on each of these wastewaters indicated that stoichiometric additions of ferrous iron can achieve efficient removal of orthophosphate from wastewater as ferrous phosphate. Since the solubility product was established at 1.3 x 10-3, ti was obvious that no appreciable orthophosphate release would occur under the reducing conditions of anaerobic digesters, even at treatment plants where ferric iron has been employed as a phosphate precipitant. (Lowry-Texas)
W72-08705

CLARIFICATION APPARATUS FOR AERATED LAGOON,
Neptune Microfloc, Inc., Corvallis, Oreg. (Assignee).
A. H. Rice, A. F. Slechta, and A. K. Hsiung.
U. S. Patent No. 3,511,380, 3 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office Vol. 874, No. 2, p 500, May 12, 1970.

Descriptors: *Patents, *Sewage treatment, *Aerated lagoons, Pollution abatement, *Waste water treatment, Water pollution treatment, Water treatment, Water purification, Separation techniques, Equipment, Aeration.
Identifiers: *Clarification.

A watertight tubular structure or container open at the top and supported from the bottom of the lagoon, isolates the interior of the container from the sewage outside. The top of the container is positioned below the normal level of sewage in the lagoon. The settling devices consist of elongate tubes of small diameter inclined to the horizontal. These are arranged so that upward flowing sewage must pass through them. (Sinha-OEIS)
W72-08739

APPLICATION OF SEWAGE TREATMENT TECHNIQUES TO FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
T. McGhee, and R. L. Torrens.
Available from the National Technical Information Service as PB-209 637. Paper presented at the 16th Annual Great Plains Waste Water Design Conference, Omaha, Nebraska, March 28, 1972. 18 p, 4 fig, 5 tab, 13 ref. OWRR-A-022-NEB (1).

Descriptors: *Biological treatment, *Farm wastes, Feed lots, Cattle, *Waste water treatment, Biochemical oxygen demand, *Agricultural runoff, *Chemical oxygen demand, *Sewage treatment, *Aerobic treatment.

Laboratory studies of the aerobic treatment of feedlot runoff were conducted to determine the effect of such handling upon waste characteristics and the design parameters required for such treatment. Liquid retention times (organic loading rate) and biological solids concentrations were varied. Studies of the application of the BOD test to this waste were also conducted. Liquid retention times in the laboratory system varied from one to eight days. The conclusions were: (1) An aerobic system can effectively treat this waste with COD reductions of 60 percent or more. (2) Retention times of three days or more are adequate to insure treatment of solids concentrations (MLSS) of 2000 mg/L. (3) The color of the runoff is affected only slightly by such treatment. (4) COD analysis is superior to BOD analysis in measuring the strength of this waste.
W72-08740

REUSE OF MUNICIPAL WASTE WATER,
A. Amramy.
Civil Engineering - ASCE, Vol. 38, No. 5, p 58-61, 1 tab, May 1968.

Descriptors: *Water treatment, *Water quality, Sanitary engineering, *Groundwater recharge, Reclaimed water, *Water reuse, Sewage treatment, Lagoons, Treatment facilities, *Waste water treatment.
Identifiers: *Israel, *Dan Region project.

Municipal waste water should be regarded as an important source of usable water. Although waste water is degraded in quality compared with water originally supplied to the municipality, proper treatment can make it suitable for economical application to a variety of uses. The purpose for which water can be re-used is dependent on the treatment and the quality of the effluent. For complex projects involving groundwater recharge, it is impossible to know beforehand the degree of feasibility because conditions may not permit adoption of design bases from similar projects. The Dan Region Project, a large-scale project serving the Tel Aviv metropolitan area, was developed by an Israeli government agency. Lagoon effluent is used for surface spreading over dune sand with a high coefficient of permeability. Details of planning, design and results are given. (Bean-AWWARF)
W72-08768

COMBINED COOLING AND BIOTREATMENT OF BEET SUGAR FACTORY CONDENSER WATER EFFLUENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
G. O. G. Lof, J. C. Ward, and O. J. Hao.
Available from the National Technical Information Service as PB-209 640, $3.00 in paper copy, $0.95 in microfiche. Environmental Resources Center Completion Report No 28, June 30, 1971. 81 p, 12 fig, 15 tab, 37 ref, append. OWRR A-008-COLO (1).

Descriptors: *Sugar beets, *Cooling water, *Cooling towers, *Trickling filters, *Biological treatment, Water reuse, *Waste water treatment, Biochemical oxygen demand, Chemical oxygen demand, Oxygenation, Aeration, Aerobic treatment, Cooling, *Industrial wastes.
Identifiers: *Combined treatment, Beet sugar condenser water treatment.

Reduction of thermal and organic pollution by heated water from the direct contact condensers on vacuum evaporators in a beet sugar factory was studied by treating samples in a laboratory-size packed column. Cooling of the water, biooxidation of dissolved organic matter (primarily sucrose), and removal of nitrogen (primarily as ammonia) were achieved by counter-current contact between descending water and a rising air stream. Organic content, as measured by COD values, in a 6-inch tower packed with a 4-foot depth of 0.84 inch Raschig rings, was reduced from an initial 110 mg/l to values of 55 and 28 mg/l by recirculation through the tower for periods of 4 to 28 hours, respectively, representing 2 to 15 cycles through the column. COD removal per effective pass through the column ranged from 11% to 52% at COD loading rates of 0.025 and 0.011 lbs COD/hr, ft sq, respectively. The cooling data were correlated by the equation, Ky a = 0.54 G where Kya is pounds of water evaporated per hour, ft cu of packing, unit humidity difference, and G is lbs air flow per hour, ft sq cross section. Adjusted temperature change in the column ranged from a low of 22 degrees (122 deg in, 100 deg out) to a high of 42 degrees (121 deg in, 79 deg out).
W72-08792

DISCUSSION OF 'ASPECTS CONCERNING THE TREATMENT OF WASTEWATERS FROM OIL REFINERIES IN ROMANIA',
Warsaw Univ. (Poland).
W. J. H. Kunicki-Goldfinger, S. Makowski, and M. Wiesztort.
In: Proceedings, 3rd International Conference on Water Pollution Research, Munich, Germany, 1966, Vol 2, p 248-256. 2 fig, 5 tab, 15 ref.

Descriptors: *Activated sludge, *Chemical wastes, *Biodegradation, Aeration, Pseudomonas, Bacteria, Toxicity, Nutrients, Synthesis, Respiration, Coagulation, Analytical techniques, *Waste water treatment, *Oil wastes.
Identifiers: *Synthetic activated sludge, *Chemical wastes, *Petrochemical wastes.

Samples of an activated sludge were centrifuged at low speed and homogenized in a mechanical shaker. The sludge was obtained from 2 modifications: (1) adaptation of activated sludge from communal sewage to the petrochemical wastes; and (2) adaptation of the mixed microflora of a polluted river. From this source, bacteria shown to be predominant strains, resistant to toxic substances and degrading tested compounds, were used to produce a 'synthetic' activated sludge. These selected strains were introduced into the aeration tank of an activated sludge unit along with a colloidal carrier (aluminum or iron hydroxide). These successful tests demonstrated that degradation of petrochemical or refinery wastewaters could be accomplished using preselected strains of Pseudomonas. Time needed for formation of the activated sludge was about 2 days, with the amount of bacterial mass required for inoculum less than one gram wet weight per cubic meter of aeration tank. The amount of colloidal carriers required was approximately 30 liters/cubic meter, and the possibility exists that the colloidal carriers may be used for coagulation before biological treatment. (See also W72-02422 and W72-08794) (Lowry-Texas)
W72-08793

DISCUSSION OF, 'ASPECTS CONCERNING THE TREATMENT OF WASTEWATERS FROM OIL REFINERIES IN ROMANIA',
Shinko-Pfaudler Co. Ltd., Kobe (Japan).
K. Sono, and M. Futaka.
In: Proceedings, 3rd International Conference on Water Pollution Research, 1966, Munich, Germany, Vol 2, p 256-259. 9 ref.

Descriptors: *Oily wastes, *Emulsions, *Suspensions, Activated sludge, Microorganisms, Coagulation, Flocculation, Lime, Oxidation-reduction potential, Acidity, Biochemical oxygen demand, Toxicity, Temperature, Organic loading, Salinity, Industrial wastes, *Waste water treatment.

Several points of information not in the paper by Negulescu are mentioned, namely: (1) oil from refinery wastes may be either emulsified or in a free particle form; (2) adaptation of the municipal activated sludge to the oily wastes was not described in detail; (3) BOD loading in the aeration tank was not specified; (4) temperature change in the mixed liquor, an extremely important parameter, was not stated. Further literature is cited to support Negulescu's report on the correlation between enzymatic activity and treatment efficiency. A further experiment on acetic acid and ethyl acetate process wastes was conducted. After neutralization and pretreatment, an influent to the biological reactor containing 800 to 900 mg/l BOD was obtained, providing a BOD loading of 0.3 to 0.4 kg/day/kg MLSS. BOD reduction in excess of 95% was obtained using fresh water as diluent, but the percentage dropped to 90% when saline water

(up to 7,500 mg/l of Cl) was used as a diluent. A bacteriological study was performed to determine the predominant microorganisms. (See also W72-02422 and W72-08793) (Lowry-Texas)
W72-08794

THE U.S. WATER QUALITY PROGRAM: BIG BOOST NEEDED FOR R AND D,
E. E. Dallaire.
Civil Engineering - ASCE, Vol 41, No 10, p 81-84, Oct. 1971.

Descriptors: *Water treatment, Sanitary engineering, *Public health, *Sewage treatment, *Waste water disposal, *Political aspects, *Research and development, *Planning, Design, Trace elements, Federal government, Water quality, *Federal budget.

A big boost in federal R and D money is recommended to the study the effects of toxicants and biostimulants on aquatic ecology and to determine the long-term effects of trace materials in drinking water on human health. The economic status of treatment plant operators should be upgraded. More federal emphasis should be placed on the collection and transportation aspects of sewage. Federal financial support is needed to develop first-rate up-to-date texts on sewage collection and treatment. A new consultant-fee system could provide incentive for innovations. Consulting firms should assume some responsibility for plant operation during the first year. (See also W72-08797) (Bean-AWWARF)
W72-08798

TERTIARY WASTEWATER TREATMENT - ON ITS WAY,
Greater Chicago Metropolitan Sanitary District, Ill.
B. Sosewitz, and V. W. Bacon.
Civil Engineering - ASCE, Vol 39, No 11, p 34-36, Nov. 1969. 3 fig, 2 tab.

Descriptors: *Water treatment, Sanitary engineering, *Filtration, Sewage treatment, *Tertiary treatment, *Water reuse, *Treatment facilities, Illinois, *Waste water treatment, Design.
Identifiers: *Microstraining, *Chicago (Ill).

A 2-mgd plant of the Metropolitan Sanitary District of Greater Chicago is yielding design and cost criteria for full-scale tertiary wastewater treatment. Knowing that a third stage of treatment eventually would be required at its three large plants of 1,900-mgd total capacity, the District designed the tertiary facility in 1966 and completed construction at the Hanover Park Wastewater Treatment Plant. In continuous operation since April 1968, the facility's basic flow line consists of rapid sand filtration preceded to chemical coagulation, flocculation, settling, and chlorination, and followed by post aeration. A 2-mgd microstrainer, followed by chlorination, is in parallel with the rapid sand filter. Results indicate the feasibility of using the basic system to meet State requirements of 4 mg/l BOD and 5 mg/l suspended solids, as well as other criteria. Bzsed on experience with the Hanover microstrainer facility, the District has let two additional contracts for a 15-mgd unit for installation at its North Side Sewage Treatment Works (410 mgd total capacity). (Bean-AWWARF)
W72-08800

SEWAGE ODOR CONTROL BY LIQUID-GAS EXTRACTION.
San Diego Water Utilities Dept., Calif.

Available from the National Technical Information Service as PB-209 641. Water Pollution Control Research Series, July 1970, 114 p, 39 fig, 31 tab, 24 ref. FWPCA Program 16050 DEX 07/70, Grant WPD 135-01-67.

Descriptors: *Odor, *Separation techniques, *Sewage effluents, California, Pilot plants, Air pollution, Waste treatment, Gases, Air-water interfaces, Hydrogen sulfide, Costs, Pollution abatement.
Identifiers: *San Diego (Calif), *Liquid-gas extraction, *Sewage odor control, Treatment costs.

An investigation into chemical methods for treatment of foul air was conducted by the City of San Diego. A pilot liquid-gas contactor was constructed of PVC lining and stainless steel shafting. Several oxidizing and absorptive chemicals (tap water, sodium hydroxide, calcium hypochlorite, potassium permanganate, copper sulfate, copper chelate, etc.) as well as biologically active materials, were used in the contactor to remove the foul odors in air vented from the sewage sedimentation tanks. Under the experimental sulfide levels of 1.0 to 20.0 ppm H2S (by weight in the gas) good removal was shown by commercial sodium hydroxide, gaseous chlorine and ammoniated copper chelate. Ozone, when used in conjunction with other reactive chemicals, helped in removal of odors other than H2S, as well as H2S. Sodium hydroxide (caustic soda) foamed excessively and would require continuous monitoring and automated feed control. Approximate costs (chemicals only for treating 1,000,000 cubic feet (28,318.5 cubic meters) of foul air range from $0.18 to $46.00 depending on sulfide concentration and chemical used. (EPA)
W72-08825

WASTEWATER RECLAMATION AT LAKE TAHOE, CALIFORNIA,
K. R. McDonald.
Water and Sewage Works, Vol 112, No 10, p 366-370, October 1965. 1 tab.

Descriptors: *Water treatment, Sanitary engineering, *Activated carbon, Electrolytes, *Waste water treatment, *Water reuse, *Tertiary treatment, Flocculation, Filtration, Filters, Treatment facilities.
Identifiers: *Multi-media filters, *Carbon filters, Lake Tahoe (Calif), Alum, Polyelectrolytes.

Transformation of wastewater into high-grade useable water is achieved at South Lake Tahoe's sewage reclamation plant. The process includes flocculation; the floc is removed by filtration in two multimedia pressure separation beds of special design. Final polishing is in twin columns of activated carbon. The plant is automated and includes equipment for regeneration of the carbon. Key to the tertiary treatment process is the addition of alum and a polyelectrolyte to the water before filtering. The 10 ft. in diameter by 38 ft. long separation beds operate under pressure, in series at 5 gpm/sq. ft. Backwash flow is 15 gpm/sq. ft. The two carbon columns operate in parallel. Each is 12 ft. in diameter and 24 ft. high with 14 ft. depth of carbon bed. (Bean-AWWARF)
W72-08855

INDUSTRIAL RE-USE OF WATER: AN OPPORTUNITY FOR THE WEST,
National Association of Manufacturers, New York. Conservation Committee.
D. W. Cannon.
Water and Sewage Works, Vol 111, No 5, p 250-254, May 1964. 17 ref.

Descriptors: Water treatment, Sanitary engineering, *Conservation, *Water reuse, *Water supply, *Industrial water, Oil industry, Industrial plants.

The re-use of water within industrial plants is discussed. Brief reference is made aiso to industrial use of water which has been previously used for municipal purposes; to agricultural use of water previously used for industrial purposes; and to municipal use of water previously used for industrial purposes. Topics are: Petroleum Industry Re-Use, Steel Industry Survey, Industrial Re-Use Increasing, Census Surveys, Non-Competitive Usage, and Municipal Re-Use. (Bean-AWWARF)
W72-08858

PROGRESS IN TECHNOLOGY OF WATER FILTRATION,
Minnesota Mining and Mfg. Co., St. Paul. Water and Sanitary Engineering Dept.
For primary bibliographic entry see Field 05F.
W72-08860

IMPROVED SLUDGE RECARBONATION AT DAYTON,
Dayton Div. of Water Supply and Treatment, Ohio.
R. C. Stout.
Water and Sewage Works, Vol 110, No 1, p 23-26, January 1963.

Descriptors: *Water treatment, *Water softening, *Lime, *Magnesium, *Sludge treatment, Treatment facilities, Reclamation, Calcium carbonate, Ohio, Waste water treatment.
Identifiers: *Lime reclamation, *Magnesium reclamation, *Recarbonation, Stack gases, *Dayton (Ohio).

Dayton has the largest lime reclamation plant in the U.S., and the only plant where sludge recarbonation is used. Magnesium is recovered by recarbonation, accomplished by passing lime kiln stack gas, containing 18 percent CO2, through ceramic diffusers, the 'Filtros Diffuser' system. The CO2 combines with magnesium hydroxide to form magnesium carbonate which is soluble and can be removed from the sludge by dewatering. The remaining sludge is relatively pure calcium carbonate and can be fed to the kiln for recalcining into lime. (Bean-AWWARF)
W72-08866

GOALS IN WASTEWATER TREATMENT,
Wiley and Wilson, Lynchburg, Va.; and Virginia Polytechnic Inst. and State Univ., Blacksburg.
M. K. Jones, and E. M. Jennelle.
Water Resources Bulletin, Paper No. 72028, Vol. 8, No. 2, p 312-319, April 1972. 5 fig, 1 tab, 4 ref.

Descriptors: *Waste water treatment, *Biochemical oxygen demand, *Chemical oxygen demand, *Carbohydrates, Control, Pollution abatement, Effluents.
Identifiers: *Pollution parameter, Waste water strength, Organic carbon, Total organic carbon.

Within a few years all domestic wastewater effluents in the United States will be subjected to a minimum of a properly operated primary and secondary treatment process. This implies a very high degree of removal of the more readily biologically degradable material as measured by the BOD test. This practice will to a large degree negate the value of the BOD test as a pollution parameter. Organic carbon appears to be a more suitable means for determining the strength of a wastewater or for controlling the operation of physical and chemical treatment processes. Studies were conducted to determine the effect of time of passage on the ratio or organic carbon to BOD, COD and carbohydrate. The ratio was found to vary with both time and the state of the sample. The carbon content was reduced to a lesser degree than the other parameters. Organic carbon content appears to correlate better with COD than with BOD. The efficiency of a chemical precipitation process can be determined on the basis of organic carbon removal. (Strachan-Chicago)
W72-08958

NEW TRENDS IN WATER-RESOURCES DEVELOPMENT,
Wright-McLaughlin Engineers, Denver, Colo.
For primary bibliographic entry see Field 05G.
W72-08960

STUDY OF REUTILIZATION OF WASTEWATER RECYCLED THROUGH GROUNDWATER,
Eastern Municipal Water District, Hemet, Calif.
For primary bibliographic entry see Field 03C.
W72-08982

INFORMATION RESOURCE: WATER POLLUTION CONTROL IN THE WATER UTILITY INDUSTRY,
American Water Works Association Research Foundation, New York.
H. A. Faber, and A. D. Nardozzi.
Copy available from GPO Sup Doc, $1.50; microfiche from NTIS as PB-209 860, $0.95. Environmental Protection Agency Water Pollution Control Research Series, November 1971, 168 p, 5 fig, 19 tab, 99 ref. EPA Program 12120 EUR 11/71.

Descriptors: *Sludge disposal, *Sludge treatment, Water treatment, Information exchange, Utilities, Surveys, Regulation.
Identifiers: *Information clearing-house, Information dissemination.

The accomplishments are described of a program conducted to organize, coordinate, and disseminate information on new or modified sludge treatment technology for water treatment plant wastes. The reliable control of these potential pollutants is of increasing importance with the enactment and enforcement of more stringent pollution control legislation. The report contains information on research, engineering, plant operation, and regulatory aspects of the problem. A Project Advisory Committee provided recommendations for development of information resources, and assisted the Research Foundation in structuring an information clearinghouse. The report describes current research activities and new approaches for characterizing and reducing water treatment plant waste volumes. A program was initiated to evaluate the applicability of polymers as primary coagulants, coagulant aids, and sludge conditioning agents. A Sub-Committee was established to prepare uniform sampling, analysis and categorization techniques for water utility sludges. Each program is in progress. Surveys were distributed to water utilities and regulatory agencies to provide information on sludge treatment methods and requirements. (EPA abstract)
W72-08983

MAXIMIZING STORAGE IN COMBINED SEWER SYSTEMS.
Seattle Metropolitan Municipality, Wash.

Copy available from GPO Sup Doc, $1.75; microfiche from NTIS as PB-209 861, $0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1971, 227 p, 64 fig, 25 tab, 54 ref. EPA-WQO Contract No. 13-WASH-1, Project No. 11022-ELK 12/71.

Descriptors: *Waste storage, *Water pollution control, *Regulation, *Computer programs, Overflow, Infiltration, Flow separation, Sampling, Computer models, Storm runoff, Storage tanks, Construction, Telemetry, Monitoring, Calibrations, Rainfall intensity, Water pollution sources, Water pollution effects, Operations, Maintenance, Waste water treatment, Waste water disposal, Washington, *Control systems, *Combined sewers.
Identifiers: *Seattle (Washington).

A major portion of the Seattle Metro area's comprehensive sewage collection and treatment plan launched in 1958, included improvements to an existing combined sewer system within Seattle's city limits. Initial plans included: (1) interception and treatment of raw sewage flowing to saltwater points, (2) regulation of combined flows to utilize all available trunk storage and (3) construction of temporary storage tanks at freshwater overflow points. In 1968, a $70 million sewer separation project was approved and will enlarge system storage by reducing storm inflow. All construction has been completed in an effort to demonstrate the feasibility of applying computer-control concepts to theoretically make maximum use of all available storage within a collection system. Automatic and manual sampling programs are monitoring overflows and adjacent waters. Accumulated and analyzed data shows dramatic improvements in receiving water quality resulting from interception and treatment phases of construction. Analysis of separation monitoring data, projects a 50-70% reduction in pollutant loading to fresh water from combined sewer overflows. Overflow volume, frequency and quality factors are established to serve as a basis for measuring the performance of the control system as it leaves the instrumented local control phase and begins the totally computer-managed phase. (EPA abstract)
W72-08984

OIL SKIMMER WITH OSCILLATABLE CIRCULAR LOOP,
E. L. Brill, and B. M. Brill.
U. S. Patent No. 3,640,394, 4 p, 11 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 895, No. 2, p 516, February 8, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Pollution abatement, Water pollution treatment, Water pollution, Equipment, Separation techniques, Skimming.
Identifiers: Oil skimmers.

An apparatus is provided for skimming oil or floating substances from a water surface. An oscillatable circular loop is gripped at its upper edge by a pair of rolls rotating in opposite directions. The rolls rotate the loop in its own plane causing it to pass into and out of the water and to attract hydrophobic material such as oil. The oil is lifted by the coil and squeezed out upon passing through the rolls. It may be separated by a scraper or a blast of air. (Sinha-OEIS)
W72-09019

APPARATUS AND METHOD FOR CONFINING AND COLLECTING OIL FLOATING ON A WATER SURFACE,
H. D. Spandau.
U. S. Patent No. 3,641,771, 5 p, 14 fig, 8 ref; Official Gazette of the United States Patent Office, Vol. 895, No. 3, p 829, February 15, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Water pollution treatment, Flotsam, Pollution abatement, Water pollution, Separation techniques, Equipment, Barriers.

A buoyant toroidal body forms a surface and subsurface barrier to confine oil floating on a water surface. It is formed from a series of gas inflated segments connected end to end. The couplings between the segments may be disconnected to provide free passage of barges and other vessels to and from the surrounded oil spill area. The deflated segments may be transported by aircraft to the required location where they may be reinflated and assembled. (Sinha-OEIS)
W72-09020

SEWAGE TREATMENT PLANT,
Pollution Control, Inc., Cincinnati, Ohio. (Assignee).
D. J. Reckers.
U. S. Patent No. 3,525,436, 3 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 877, No. 4, p 822, August 25, 1970.

Descriptors: *Patents, *Sewage treatment, *Aeration, Water pollution treatment, Water pollution, *Waste water treatment, Waste water, Pollution abatement, Equipment, Separation techniques, Skimming, *Treatment facilities.

The sewage treatment plant consists of an aeration tank and a clarifier receptacle. The nozzle within the aeration tank releases a flow of air into the liquid sewage. A device for skimming of floating debris is provided. (Sinha-OEIS)
W72-09024

WATER PURIFICATION PROCESS,
R. A. Willihnganz.
U. S. Patent No. 3,494,864, 2 p, 2 ref; Patent Abstracts Section, Official Gazette, Vol. 871, No. 2, p 571, February 10, 1970.

Descriptors: *Patents, Water purification, *Oil wastes, *Flocculation, Oily water, Bubbles, Flotation, Sedimentation, Separation techniques, Solid wastes, Water pollution, Water pollution treatment, Pollution abatement, *Waste water treatment.
Identifiers: Aluminum hydroxide.

A process is described for the removal of insoluble pollutants from water by using aluminum hydroxide. The slurry of aluminum hydroxide and the pollutant is treated with an alkali to convert the aluminum hydroxide to a water soluble aluminate salt. This is done at elevated temperatures with agitation. The oily materials will form an immiscible layer which separates readily from the aluminate salt solution and can be removed and reclaimed. The particulate solids can be removed by sedimentation, centrifugation or filtration. (Sinha-OEIS)
W72-09029

PULP MILL INTERNAL-EXTERNAL POLLUTION CONTROL ECONOMIC MODELLING FOR RECEIVING WATER PROTECTION,
EKONO, Seattle, Wash.
For primary bibliographic entry see Field 06A.
W72-09070

MINIMUM COST REGIONAL POLLUTION CONTROL SYSTEMS,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 06A.
W72-09075

5E. Ultimate Disposal of Wastes

A TECHNICAL EVALUATION OF LAND DISPOSAL OF WASTE WATERS AND THE NEEDS FOR PLANNING AND MONITORING WATER RESOURCES IN DANE COUNTY, WISCONSIN.
For primary bibliographic entry see Field 05G.
W72-08557

MARINE WASTE DEPOSITS NEAR NEW YORK,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 05B.
W72-08803

HARDNESS, TENSILE STRENGTH, AND IMPACT TOUGHNESS OF RESERVOIR SANDSTONE AT EXTREME TEMPERATURES,
Bureau of Mines, Morgantown, W. Va. Morgantown Energy Research Center.
For primary bibliographic entry see Field 08E.
W72-08813

DREDGING DISPOSAL: REAL OR IMAGINARY DILEMMA,
Corps of Engineers, Boston, Mass. New England Div.
For primary bibliographic entry see Field 05B.
W72-08955

5F. Water Treatment and Quality Alteration

NEW WASTEWATER TREATMENT PROCESSES - EPA ENCOURAGES ADOPTION,
Environmental Protection Agency, Washington, D.C. Office of Water Programs.
For primary bibliographic entry see Field 05D.
W72-08617

FILTRATION3 1. THE SIGNIFICANCE OF THEORY,
University Coll., London (England).
For primary bibliographic entry see Field 05D.
W72-08618

FILTRATION: 2. EXPERIMENTAL DEVELOPMENTS,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 05D.
W72-08619

THE SOFTENING OF BUNTER SANDSTONE WATERS AND RIVER WATERS OF VARYING QUALITIES IN PELLET REACTORS,
Fylde Water Board, Blackpool (England).
M. A. Hilson, and F. Law.
Journal of Water Treatment and Examination, Vol. 19, Part 1, p 32-50, 1970. 5 fig, 1 tab, 2 ref.

Descriptors: *Water treatment, *Water quality, Sanitary engineering, *Water softening, Design, Economics, Costs, Lime, Rivers, Pilot plants.
Identifiers: *Pellet reactor process, *Sandstone waters, England.

The experiences of the Fylde Water Board in the operation of a full scale plant softening borehole water by the pellet reactor process are described. Pilot plant investigations of the feasibility of the process in the softening of river waters are discussed. The economics of the process and the direction of future investigation and development are outlined. Some advantages of the pellet reactor are listed: (a) About 95 per cent of the hardness removed is in the form of easily handleable pellets thus reducing enormously the sludge disposal problem. The surplus pellets are sold; (b) Plant required is more compact and less costly than a conventional softening plant; (c) No coagulant is required. This reduces both capital and operational costs and also alleviates the sludge problem. Limitations of the pellet reactor are listed also: (a) Only calcium temporary hardness can be removed by this process. Magnesium hydroxide is not crystalline and is, therefore, carried over from the reactors; (b) In the original design the process required more control than the conventional process. However, present work on reactor design indicates that this may not be so. The plant is now manned only from 0800 to 1630 daily. Discussion includes differences between the pellet and conventional plants, designs of the reactors, lime dosing, effect of pellet size, control of pellet size, chemical aspects and economics. (Bean-AWWARF)
W72-08620

DEVELOPMENTS IN TREATMENT OF RIVER THAMES WATER AT STAINES,
South West Suburban Water Co. (England).
J. Jeffery.
Journal of Water Treatment and Examination, Vol. 20, Part 1, p 52-63, 1971. 6 tab, 5 ref.

Descriptors: *Water treatment, Sanitary engineering, *Filtration, Water quality, Flow rates, *Instrumentation, *Laboratories, Taste, Odor, Design, *Treatment facilities, *Filters, Rivers.
Identifiers: *Granular carbon filters.

Various changes in the plant are described and quality of water produced is detailed for the period 1963-9. Conclusions are: (a) Results justify the decision made in 1969, that slow-sand filters need no longer form a part of the treatment system, (b) Information provided by better instrumentation is a very important factor in the improved performance of sedimentation and rapid gravity filtration which in turn is the main justification for the above decision. (c) Results have shown that the treatment plant can be operated at much higher rates than those for which it was designed. This may raise further problems over a long period of operation. The solution of these problems may involve methods which are only rarely used at present, such as granular carbon filters for taste and odor control. (d) Whatever method of treatment is in use, the key requirement is information on the performance of the process which makes control possible. This can come only from well chosen instrumentation of the treatment plant backed up by a well equipped and well staffed laboratory and instrument section. (Bean-AWWARF)
W72-08621

DESIGNING LAUNDERS FOR SETTLING TANKS,
Hefter (Harry O.) Associates, Inc., Chicago, Ill.
C. A. Lee.
Civil Engineering - ASCE, Vol. 40, No. 8, p. 69, August 1970. 3 fig.

Descriptors: *Water treatment, Sanitary engineering, Design, *Sedimentation, *Laundering, Settling basins.
Identifiers: *Settling tanks.

The use of launders in settling tanks introduced time elements depending upon the spacing. An equation covering the effect of launders can be used to produce an arrangement that can increase the time devoted to the settling of material. (Bean-AWWARF)
W72-08623

CORROSION, WATER COMPOSITION AND WATER TREATMENT,
British Non-Ferrous Metals Research Association, London (England).
H. S. Campbell.
Journal of Water Treatment and Examination, Vol. 20, Part 1, p 11-25, 1971. 1 fig, 18 ref.

Descriptors: *Distribution systems, *Water treatment, Sanitary engineering, *Corrosion, Hardness (Water), Hydrogen ion concentration, Chlorine, Copper, Water softening, Aeration.
Identifiers: Dezincification, Brass, Galvanized steel.

The influence of water composition and of common water treatment procedures on the corrosion of metals in water distribution systems and plumbing systems are discussed. General aspects of water composition, the effects of water composition on corrosion of the more commonly used metals, and the effects of flocculation, softening, and other water treatments are described. A rough classification of supply waters into four groups, indicative of their corrosion properties, is suggested. (1) Deep well waters from chalk or sandstone, characteristically hard with very low organic content. Treatment usually is only chlorination, plus aeration to remove CO2. Usually the waters are satisfactory for galvanized steel, give little trouble from dezincification except of ball-valve seating and may produce pitting in copper tanks or pipes containing carbon films. (2) Upland surface waters, are soft and have a low pH. Conventional treatment produces water that is too soft to be satisfactory with galvanized steel but normally will give no trouble with copper. Dezincification may or may not be a problem depending on the levels of chloride and temporary hardness. (3) Slow sand filtered river waters, are usually hard with high-colloidal organic content. They lay down protective carbonate scales. Normally they contain the organic inhibitor of corrosion of copper. Galvanized steel, copper and duplex brass can all be safely used in waters of this type. (4) Lime softened waters produce meringue dezincification of duplex brass and are liable to give trouble with galvanized steel since they cannot form carbonate scale. Because of high pH pitting corrosion of copper does not occur. (Bean-AWWARF)
W72-08624

SOFTENING OF CHALK WELL WATER AND RIVER WATER IN A PELLET REACTOR FOLLOWED BY UPWARD FLOW SAND FILTRATION,
Sutton District Water Co. (England).
E. G. B. Glenhill, and A. W. H. McCanlis.
Journal of Water Treatment and Examination, Vol. 19, Part 1, p 51-69, 1970. 6 fig, 1 tab.

Descriptors: *Water treatment, Water quality, Sanitary engineering, *Water softening, Design, Economics, Costs, *Treatment facilities, Pilot plants, Rivers, Wells, *Filtration.
Identifiers: *Pellet reactor process, *Chalk well waters, England.

The Sutton District Water Company is under statutory obligation to soften water to a hardness below 129 mg/1. Three types of softening plants have been in operation for years (Clark's batch plant, Haines continuous softening plant with cloth filters, and two Spaulding precipitation units) but in modernizing it was decided to replace the Clark and Haines plants with pellet-type, lime-softening, reactor plants. Such plants have been in operation on an industrial scale for many years, but they are comparatively new for the treatment of water for public supply. A 2300 m3/d unit was purchased in 1963 and tested in two locations. An Immedium Filter was added in the second of these tests. This type of pellet reactor is highly satisfactory for the waters which require softening by the company. Installation of a hydraulic separator considerably lengthened periods during which good softening, stabilization and clear water can be produced. The production of free-flowing and almost self-drying chalk pellets or grits, whose size can be controlled, and which are easy to handle, represents a great improvement upon the production of fine chalk powder which is expensive to dry and calcine. The Immedium Filter (upflow) has been satisfactory as a polishing filter. (Bean-AWWARF)
W72-08626

A SURVEY OF AMINALS IN DISTRIBUTION SYSTEMS,
Sussex River Authority (England).
L. C. Smalls, and G. F. Greaves.
Journal of Water Treatment and Examination, Vol. 17, part 3, p 150-183, 1968. 4 fig, 1 tab, 18 ref.

Descriptors: *Distribution systems, *Water treatment, *Public health, Water quality, Sanitary engineering, Taste, Odor, Organic matter, *Aminals, Insects, Midges, Snails, Mollusks, Shrimp, Rotifers, Mussels, Microorganisms.
Identifiers: Sponges, Leeches, Flatworms, Roundworms, England.

Extensive biological data are presented on various sponges, 'jellyfish', pipe-mosses, rotifers, flatworms, roundworms, true worms, leeches, waterfleas of Daphnia and Cyclops types, 'seed shrimps,' freshwater shrimps, water mites, waterbears, insects, midge and fly larva, water beetles, water bugs, molluscs (snails) and bivalves (mussels). Animals occurring in the mains cause aesthetic objections but are not known to involve risks to public health. They may give rise to complaints by appearance at taps, by discoloring the water or possibly by causing tastes and odors; Most infestations are by animals that have passed through the treatment works. Insects may enter via service reservoirs. Underground supplies generally contain fewer species and smaller num-

bers of organisms than surface derived supplies. The food supplies for the animals are either suspended organic matter or dissolved organic matter which could be made available to the animals by microorganisms. Low flows in mains permit particulate food to settle out thus real and hydraulic dead-ends often support large populations. Badly encrusted mains provide crevices in which animals can shelter from increased flows. Populations vary by season and presence of competing species. Stable populations may exist which do not cause trouble until conditions favorable to their proliferation occur. Increased populations which are left unchecked can lead to consumer complaints; Control measures are available but the species and its habits should be studied before deciding on which method of control to employ. (Bean-AWWARF)
W72-08627

THE PROBLEM OF VIRUSES IN WATER,
Metropolitan Water Board, London (England).
S. F. B. Poynter.
Journal of Water Treatment and Examination, Vol. 17, Part 3, p 187-198, 1968. 1 tab, 36 ref.

Descriptors: Water quality, Sanitary engineering, *Public health, *Water treatment, *Diseases, *Viruses, Disinfection, Filtration, Flocculation, Percolation, Storage, Rivers.

Viruses known to be transmitted in water and the others known to be present in waters are described. Problems caused by viruses in water, the entero-viruses in sewage and sewage effluents, and virus pollution of rivers are discussed. The effects of storage, soil percolation, primary sand filters (rapid or gravity filters), flocculation, and sand filtration at slow rates are described. Disinfection methods are evaluated. (Bean-AWWARF)
W72-08628

DIATOMITE FILTRATION OF GOOD QUALITY SURFACE SUPPLIES,
Johns-Manville Products Corp., Manville, N.J.
D. W. Davis, T. S. Brown, S. Syrotynski, and E. Henderson.
Chemical Engineering Progress Symposium Series No. 97, Vol 65, 1969, p 133-139, 3 fig, 2 tab, 10 ref.

Descriptors: *Diatomaceous earth, *Filtration, *Separation techniques, Turbidity, Suspended solids, Algae, Pilot plants, Head loss, Permeability, Temperature, Operation and maintenance, Design criteria, *Water treatment, *New York, Water purification.
Identifiers: *Massena (NY).

The design of diatomaceous earth filters for water purification still requires pilot plant data on the actual filtration characteristics of each water to be filtered. In addition, the traditional approach to diatomite filtration uses body feed levels expressed as a ratio of milligrams/liter of body feed to the measured turbidity. However, full scale operational data obtained at the Massena, New York Water Treatment Plant have demonstrated that the body feed to turbidity required for economic operation is much higher than the range of 2-5 commonly found to be desirable at other locations. Since these problems were anticipated, measurements of the water quality by direct microscopic counts was also employed, and subsequent investigations revealed that the total count variations exerted a greater influence on the filter performance than the turbidity (optically measured). Further items for consideration when planning an experimental program to obtain design data include: (1) review of historical data; (2) use of a wide enough variation of body feed levels and filter aids to preclude excessive extrapolation; and (3) tests should be run at times of poorest feed water quality. (Lowry-Texas)
W72-08686

ALGAL REMOVAL WITH A DIATOMACEOUS EARTH REVERSIBLE CAKE FILTER,
Granger Filter Co., Wakefield, Mass.
J. G. Brown.
Chemical Engineering Progress Symposium Series No. 97, Vol 65, 1969, p 128-132, 1 tab, 7 ref.

Descriptors: *Algae, *Filtration, *Diatomaceous earth, Separation techniques, Pressure, Flow rates, Sludge, Slurries, Automatic control, Piping systems (Mechanical), Cleaning, Cost analysis, Water purification, *Water treatment.
Identifiers: *Algae harvesting, *Diatomite filtration.

Lagoon waters containing varying concentrations of green algae were filtered through a standard Granger C-33 reversible filter with diatomite precoat at high velocity during a 10 week pilot plant test. The filter cloth comprised 22 square feet and was made of monofilament polypropylene. The pilot plant included an automatic cycle controller with air operated valves, and a diatomite slurry handling system including a sludge pump, lift pump, and an agitated diatomite settling and decanting tank. The success of the self-plugging backwash of the reversible filtration process was demonstrated, as was the effectiveness of using high internal filter velocities, low pressure drops across the cake, and smooth monofilament polypropylene cloth. Filtrate averaged 10 ppm of algae, while the recycled concentrated stream contained 500 ppm of algae. Total costs for removal of 0.54 lb algae/1000 gallons using 2.2 lb of diatomite/lb of algae were estimated at 8.6 to 13.6 cents/1000 gallons processed. After 10 weeks of nearly continuous operation, the filter did not require cleaning. The experience in operation acquired from the pilot plant tests will hopefully make the economics of the process even more attractive. (Lowry-Texas)
W72-08688

THE TREATMENT OF LOW QUALITY WATER SUPPLIES: BATCH AND CONTINUOUS FOAM SEPARATION,
Kentucky Univ., Lexington.
R. B. Grieves, and W. L. Conger.
Chemical Engineering Progress Symposium Series, No. 97, Vol 65, 1969, p 200-206, 5 fig, 1 tab, 10 ref.

Descriptors: *Turbidity, *Suspended solids, *Flotation, Separation techniques, Surfactant, Adsorption, Activated carbon, Chlorination, Flow rates, Research and development, Laboratory tests, Cost analysis, Waste water treatment, *Water treatment, *Foam separation.

A 3 liter capacity batch foam separation unit was used to determine the feasibility of clarifying high turbidity natural waters by the foam separation process. With the batch unit, raw waters ranging from 20 to 250 Jackson candle units were successfully treated with a maximum of 45 mg/l of a cationic surfactant (cetyldimethyl-benzylammonium chloride) and 25 min of aeration time at 3 liters/min., delivered at 3 to 15 lb/m2 gauge. Residual turbidities of less than 5 JTU were achieved at residual surfactant concentrations of less than 1.0 mg/1. A continuous flow unit, consisting of dissolved air flotation, column adsorption with activated carbon, and terminal hypochlorite disinfection was also tested. Turbidities were reduced from 150 JTU to 5 JTU with 45 mg/l of surfactant, 4.6 liter/min air flow, and a 50 min detention time. Air to liquid feed ratio was about 175. Surfactant cost was 37 cents/1000 gal. The process was rather insensitive to pH, temperature, and water quality, as well as simple to operate in terms of equipment and controls. (Lowry-Texas)
W72-08693

OZONE DISINFECTION,
Harris (Weldon C.) and Associates, Doylestown, Pa.
W. C. Harris.
Journal of the American Water Works Association, Vol 64, No. 3, March 1972, p 182-183, 2 fig, 3 ref.

Descriptors: *Potable water, *Microorganisms, *Ozonation, Oxidation, *Disinfection, Chlorination, Mixing, Solubility, Cost analysis, Safety, *Water treatment.

Much interest has been developed in the process of ozonation since at least 15 major companies which produce bottled water are currently using the process. At concentrations of 0.5 mg/1 ozone exhibits a 'flash point' after which no living organisms remain. Because of the rapid disinfection properties of ozone, contact times for disinfection usually range from 5-10 min., based upon bacterial quality. Ozone in a 2.5-5.0 mg/1 dosage is sufficient to disinfect even poor quality surface supplies, but even in the highest dosages used, the ozone disappears from the water in 1/2 hour. By its nature and its production techniques, as well as its pungent odor, ozone is one of the safest of water treatment chemicals to produce and apply. An application of the City of Strasburg, Pennsylvania, to use ozone for water supply disinfection was approved after study of the bottled water plants using ozone demonstrated that no chlorine residuals were necessary when ozone is used in small looped systems. Ozone will be produced at the Strasburg plant for $4.35/mil. gal. (Lowry-Texas)
W72-08696

SOME RECENT ADVANCES IN WATER TREATMENT TECHNOLOGY,
Neptune Microfloc, Inc., Corvallis, Oreg.
For primary bibliographic entry see Field 05D.
W72-08697

DESIGNING FILTRATION PLANT WASTE--DISPOSAL SYSTEMS,
Weston (Roy F.), Inc., Roslyn, N.Y.
J. A. DeFillippi.
Journal of the American Water Works Association, Vol 64, No. 3, March 1972, p 185-187, 3 fig.

Descriptors: *Sludge disposal, *Water treatment, *Chemical wastes, Sampling, Laboratory tests, Suspended solids, Coagulation, Sedimentation, Centrifugation, Vacuum drying, Filtration, Landfills, Water quality control, Waste water treatment, Treatment facilities.

Increased regulatory agency emphasis on protecting water courses from shock-type wasteloads, increasing raw-water, chemical, and labor costs, and cost and availability of land are all problems besetting water treatment plant operators. In either designing waste treatment facilities for an existing plant, or designing a new plant with fully integrated facilities, these design steps must be followed: (1) define waste quantity, quality, and variability; (2) determine sludge dewatering characteristics; and (3) design the process including choices of subsystems and final layout of a flow diagram. To provide data for step 1, samples are taken of raw water, settled water, settling basin sludge, and filter backwash water, and determining the suspended solids content of all samples to determine the ultimate quantities of solids to be handled. Step 2 is accomplished through laboratory and pilot plant investigations. Treatability studies are then necessary to determine the optimum treatment process for inclusion in the final design. (Lowry-Texas)
W72-08701

HIGH-RATE FILTRATION,
Blacksburg-Christianburg-VPI Water Authority, Blacksburg, Va.
W. B. Kirchman, and W. H. Jones.
Journal of the American Water Works Association, Vol 64, No. 3, March 1972, p 157-161, 2 fig, 9 ref.

Descriptors: *Potable water, *Coagulation, *Filtration, Flocculation, Lime, Polyelectrolytes, Mixing, Sedimentation, Monitoring, Instrumentation, Turbidity, Analytical techniques, Head loss, Cleaning, Water quality control, *Water treatment.
Identifiers: *Mixed-media filters, *Alum.

High-rate filtration systems, as defined by the minimum process requirement of the Virginia State Department of Health, must include: (1) coagulation process controls; (2) turbidity monitoring and recording equipment; (3) 0.5 to 3.0 min. rapid mix; (4) 20 min. mechanical flocculation; (5) 3 hour settling; (6) multi-media filter rates less than 4.0 gpm/ft2 treating influent water average turbidity levels of 2.0 JTU or less to effluent levels between 0.1 to 0.2 JTU with a 0.5 JTU max.; and (7) filters must be provided with surface wash. The benefits of such a high-rate filter include higher flow rate water treatment (more effective facility use), water of predictable quality (assured through process monitoring, and minimum capital and operating costs. Of prime importance is the recommendation that all items of equipment and accessories effecting filter performance be the responsibility of a single supplier. In addition, plants designed for 2.0 gpm/ft2 filter rate should be capable of being 'high-rated' with modifications requiring minimum major replacement. A properly designed high-rate filtration plan can provide both systems and controls for processing water of the highest quality at the least cost. (Lowry-Texas)
W72-08702

STABLE WATER TREATMENT AT MOUNT CLEMENS,
Mount Clemens Water Purification and Pumping, Mich.
R. E. Hansen.
Water and Sewage Works, Vol 118, No 5, p 146-150, May 1971. 1 fig, 7 photo, 1 ref.

Descriptors: *Distribution systems, *Water treatment, Water quality, *Corrosion, Calcium compounds, *Socium compounds, Hydrogen ion concentration, Activated carbon, Taste, Odor, Color, Michigan.
Identifiers: *Red water, *Sodium hexametaphosphate, *Sodium zinc glassy phosphate. *Mount Clemens (Mich).

A bad red water and corrosion problem has been solved. Two products have been used to enable Mt. Clemens to meet the AWWA Quality Goals for Potable Water. Granular carbon filters are used for taste and odor removal, and socium zinc glassy phosphate provides stable water treatment and prevents corrosion of cast iron mains and valves. High turbidities in Lake St. Clair require high alum dosages that may lower the pH to 5.9. Adjustment with lime to pH 7.4 with sodium hexametaphosphate treatment was not a satisfactory solution. Application of sodium zinc glassy phosphate at 2 mg/l at temperatures below 60 deg F and 1 mg/l at higher temperatures was adopted. (Lime application was discontinued.) Cast iron coupons inserted through plugs in the mains generally show less than 2 mills/yr. corrosion rate. (Bean-AWWARF)
W72-08796

THE U.S. WATER QUALITY PROGRAM: DESPERATE NEED FOR PLANNING,
For primary bibliographic entry see Field 05G.
W72-08797

THE U.S. WATER QUALITY PROGRAM: BIG BOOST NEEDED FOR R AND D,
For primary bibliographic entry see Field 05D.
W72-08798

TERTIARY WASTEWATER TREATMENT - ON ITS WAY,
Greater Chicago Metropolitan Sanitary District, Ill.
For primary bibliographic entry see Field 05D.
W72-08800

WASTEWATER RECLAMATION AT LAKE TAHOE, CALIFORNIA,
For primary bibliographic entry see Field 05D.
W72-08855

IRON AND MANGANESE REMOVAL BY SPLIT FLOW TREATMENT,
Eau Claire Dept. of Public Works, Wis.
L. V. Owens.
Water and Sewage Works, Vol 110, Ref. Ed., p R79-R87, October 1963. 8 fig, 4 ref.

Descriptors: *Water treatment, *Filtration, *Sedimentation, *Iron, *Manganese, Calcium compounds, *Stabilization, Hydrogen ion concentration, Carbon dioxide, Distribution systems, Costs.
Identifiers: *Split-flow treatment, Depositions.

Iron and manganese removal from well water by use of calcium hydroxide produced a final effluent with pH of 9.85. This caused severe deposition of carbonates in the distribution system, hot water heaters, boilers and heat exchangers. As a result it was necessary to install recarbonation equipment for stabilization control. This was costly to operate since liquid carbon dioxide was used. Split flow treatment was adopted, the pH dropped from 9.85 to about 8.5 and very little recarbonation was required, sometimes none. Use of lime, sodium silicate and the activating agent was reduced to half the previous requirement. Total chemical cost per million gallons produced was $10.54 in 1961. (Bean-AWWARF)
W72-08856

PRE-TREATMENT LICKS ALGAE PROBLEM,
Oshkosh Dept. of Public Works, Wis.
J. Strauss.
Water and Sewage Works, Vol 110, No 7, p 267-268, July 1963. 2 fig.

Descriptors: *Water treatment, Sanitary engineering, *Filtration, Design, *Algae, Copper sulfate, Sedimentation, Activated carbon, Chlorine, Costs, Treatment facilities, Cleaning, *Algal control, Wisconsin.
Identifiers: Alum, *Oshkosh (Wis), Backwashing.

On an 8.8 mgd filter plant at Oshkosh, 9.8 percent washwater was sometimes required, because algae clogged the filters. Chlorine, alum, and activated carbon applied inside the plant reduced unpleasant tastes and odors but did not eliminate sufficient quantities of algae. A 30 acre presettling basin was constructed in a bay near the plant, with baffle walls to insure maximum retention. Water enters the basin through a 36 in. steel line to 2,000 ft. out in the lake. Copper sulfate solution is pumped into the intake line as water enters the basin. After the pre-settling chlorine, activated carbon and alum are applied in the mixing tank. Treatment in conventional settling basins and filtration follow. During the first five months of operation the average number of filters washed daily was 3.8 rather than the previous 18.6. Backwashing water was reduced to 2.6 percent and cost of chemicals was reduced to 70 percent of the previous cost. (Bean-AWWARF)
W72-08859

PROGRESS IN TECHNOLOGY OF WATER FILTRATION,
Minnesota Mining and Mfg. Co., St. Paul. Water and Sanitary Engineering Dept.
J. T. Ling.
Water and Sewage Works, Vol 109, No 8, p 315-319, August 1962. 2 fig, 2 tab, 52 ref.

Descriptors: *Water treatment, Sanitary engineering, *Filtration, *Design, *Filters, Waste water treatment.
Identifiers: Bi-flow filters, Dual-flow filters, Dual-media filters.

History of filtration and present conventional designs and practices are described and discussed. New designs which have been used in other countries and their advantages are discussed. The principal change described is the bi-flow filter in which unfiltered water enters the bottom of the filter as well as the top, passing through filter beds to the collectors which are placed midway of the filter depth. Total filtering rate per sq. ft. area is thus doubled. Wash water enters the bottom of the filter and leaves by way of wash water gutters above the top of the filter bed. (Bean-AWWARF)
W72-08860

PRESTRESSING WATER FOR CORROSION CONTROL,
Long Beach Dept. of Water, Calif.
W. B. Murray.
Water and Sewage Works, Vol 109, No 8, p 305-309, August 1962. 2 fig, 5 tab.

Descriptors: *Water treatment, *Corrosion, *Corrosion control, Direct current, *Distribution systems, Aluminum, Magnesium, Anodes.
Identifiers: *Anodic treatment.

A process of corrosion control is described that is based on the assumption that if a corrosive water is exposed to a greater voltage than that which might be encountered in the distribution system, the aggressive characteristics of the water will be reduced. Contact of water with magnesium as a sacrificial anode is suitable only for local corrosion prevention and does not provide the protection necessary for installations located remotely downstream. Corrosion of metallic surfaces in water can be reduced by applying dc voltages to sacrificial aluminum electrodes. This process is intended to suppress the metal-attacking characteristics of water supplies which must be pretreated prior to their distribution as a means of protecting plumbing located remotely downstream. The aluminum content of the treated water is not stated. (Bean-AWWARF)
W72-08864

NEW POTASSIUM PERMANGANATE TECHNIQUES,
Carus Chemical Co., LaSalle, Ill.
S. B. Humphrey, and M. A. Eikelberry.
Water and Sewage Works, Vol 108, No 5, p 204-206, May 1961. 22 ref.

Descriptors: *Water treatment, *Potassium compounds, *Taste, *Odor, Manganese, Iron, *Treatment facilities, Cleaning, Illinois, Texas, Pennsylvania, Connecticut, Iowa.
Identifiers: Greensand, Backwashing, *Permanganate, Peru (Ill), Waxahachie (Tex), Royersford (Penn), Colchester (Conn), Westview (Penn), Melcher (Iowa), Wilkinsberg (Penn).

Potassium permanganate was used as early as 1927 for taste and odor removal. It destroys certain organic substances causing musty, earthy, grassy, fishy, medicinal and chemical odors. Installations for this purpose are cited at Peru, Illinois, Waxahachie, Texas, and Royersford, Pennsylvania. Applications of potassium permanganate for iron removal and regeneration of greensand are cited at Colchester, Connecticut, Westview, Pennsylvania, Melcher, Iowa, and Wilkinsberg, Pennsylvania. Iron, manganese and hydrogen sulfide are oxidized by the permanganate. Some advantages of permanganate application are, small dosages are required, utilization of existing equipment generally, sollutions are not corrosive, and dosage required is generally determined by visual observation of the color produced. (Bean-AWWARF)
W72-08865

IMPROVED SLUDGE RECARBONATION AT DAYTON,
Dayton Div. of Water Supply and Treatment, Ohio.
For primary bibliographic entry see Field 05D.
W72-08866

SPLIT TREATMENT FOR STABILIZATION,
Saint Louis County Water Co., University City, Mo.
J. L. Tuepker.
Water and Sewage Works, Vol 108, No 4, p 158-162, April 1961. 5 fig, 2 tab, 9 ref.

Descriptors: *Water treatment, Sanitary engineering, *Water softening, *Stabilization, Corrosion, Hydrogen ion concentration, Lime, Calcium, Magnesium, *Calcite.
Identifiers: *Split-treatment, *Meramec River.

Meramec River water can be lime softened so that it is stable at 140F by treating approximately 75 percent of the water with 0.5 milliequivalents per liter excess lime in the presence of 3 1/2 to 4 percent recirculated slurry, bypassing approximately 25 percent of the raw water and taking advantage of normal coagulant and chlorine dosages for additional pH reduction. This treatment utilizes lime efficiently and produces a quality product with minimum capital investment for chemical treating facilities. Combining solids contacting with split treatment results in increased calcium residual and decreased magnesium residual in the treated water. Magnesium hydroxide is carried out of the recirculated slurry and must be settled out before reducing the pH. (Bean-AWWARF)
W72-08867

CALCITE COATING PROTECTS WATER PIPES,
Michigan State Univ., East Lansing. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08G.
W72-08868

THE EFFECT OF ORGANIC MATERIALS ON IRON REMOVAL IN GROUND WATER,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
L. R. Robinson, Jr.
Water and Sewage Works, Vol. 114, No. 10, p 377-382, October 1967. 1 fig., 1 tab., 28 ref. PHS WP-17.

Descriptors: *Water treatment, Sanitary engineering, *Filtration, *Iron, Bacteria, *Groundwater, Organic matter, Aeration, *Colloids.

Organic materials in ground waters do not interfere with oxidation of ferrous iron to the ferric state. Some organic extracts obtained from ground water can hold iron in a filterable condition in laboratory tests in alkaline conditions but upon addition of sufficient excess iron, all the iron is retained by filtration. This indicates that the organic materials probably create colloidal dispersions and not soluble cholates. Although extracts obtained from the waters were able to maintain the iron in a filterable condition in laboratory tests, field test never were able to reproduce this phenomenon. It is hypothesized and apparently verified by Engelbrecht, et al, that the actual interference with iron removal is biological activity, supported by humic acid in well water, creating reducing conditions in a slime layer at the surface of or within the filters. These reducing conditions may reconvert the iron to the soluble ferrous form. (See W72-08870) (Bean-AWWARF)
W72-08869

IRON REMOVAL BY AERATION AND FILTRATION,
Illinois Univ., Urbana. Dept. of Civil Engineering.
R. S. Engelbrecht, J. T. O'Connor, and M. Ghosh.
Water and Sewage Works, Vol. 114, No. 4, p 123-128, April 1967. 3 fig., 5 tab., 21 ref.

Descriptors: *Water treatment, Sanitary engineering, *Iron, *Bacterial, Aeration, Chlorination, *Filtration, Flocculation, Dissolved oxygen, Reduction (Chemical), Oxidation.
Identifiers: Oxygen depletion, Permanganate.

A depletion of DO in water as it is filtered results in a high iron content in the finished water, a considerable amount of which is in ferrous form. Both the bacterial population and the amount of iron passing the filter increase with time of filtration following backwashing. Depletion of DO as a result of the bacterial growth leads to the development of a reducing environment in the filter; this is accompanied by a slow decrease in the oxidation potential within the filter. This condition is responsible for the reduction of iron from ferric to ferrous form. In view of these observations, it would seem desirable to improve the design criteria so that greater amounts of iron can be removed before filtration. This will necessitate a better understanding of the surface properties of the insoluble forms of iron and their colloidal behavior so as to enhance flocculation of the oxidized iron. Another remedial measure might be to ensure that the filter is always aerobic. This might be accomplished by continuous or intermittent application of chlorine to control biological growths. (Bean-AWWARF)
W72-08870

IRON AND MANGANESE PRECIPITATION IN LOW ALKALINITY GROUNDWATERS,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
L. R. Robinson, Jr., and R. I. Dixon.
Water and Sewage Works, Vol. 115, No 11, p 514-518, November 1968. 5 fig, 1 tab, 13 ref.

Descriptors: *Water treatment, *Iron, *Manganese, *Groundwater, Calcium compounds, Sodium compounds, Hydrogen ion concentration, Alkalinity, Chemical precipitation.
Identifiers: Ferrous iron, Ferric iron, Caustic soda.

For immediate oxidation of ferrous iron in natural waters with low alkalinities it is necessary to raise the bicarbonate alkalinity. Soda ash, lime or caustic soda can be used; with soda ash the alkalinity should be 120-130 but with lime or caustic 100-120 is sufficient. Potassium permanganate can be used as the oxidant for ferrous iron without raising the pH or alkalinity. A manganese zeolite filter is recommended in order to insure removal of all manganese. Successful ferrous oxidation has been performed (with time) at pH values as low as 6.6. The concentration of alkalinity has little effect on the removal of manganese. When the pH is raised to 9.5 complete precipitation of the manganese occurs. In low alkalinity waters that contain both iron and manganese, the best chemical additive is caustic soda. It produces no hardness, and when added to produce pH of 9.5 the alkalinity generally is automatically raised to 100-120 mg/l. In this manner, both iron and manganese can easily be removed. Possibly recarbonation after filtration would be necessary to obtain a stable water. (Bean-AWWARF)
W72-08872

SPLIT TREATMENT LIME SOFTENING REDUCES OPERATING COSTS AT AMES, IOWA,
Iowa State Univ., Ames.
R. Roskoph, and J. L. Cleasby.
Water and Sewage Works, Vol. 114, No. 12, p 477-480, December 1967. 4 fig, 12 ref.

Descriptors: *Water treatment, Water quality, *Water softening, Hardness (Water), *Costs, Filtration, Iowa, Sludge, Cost comparisons, Treatment facilities, Cleaning.
Identifiers: *Split-treatment softening, Return sludge, Backwashing, *Ames (Iowa).

At Ames, Iowa, the desired water quality of 85 ppm total hardness, 35 ppm total alkalinity was produced by split treatment. A stable effluent was produced and no hardness was removed on the filters, in contrast to removal of 15 to 30 ppm with conventional and two-stage softening. Filter runs were tripled with a savings in backwash waters. About 25 percent by-passing was found desirable. Adding some soda ash to the second stage permitted a small reduction in required lime feed. Value of high sludge concentration (by use of return sludge) in the softening reaction zone, was confirmed. A mixture of first and second-stage sludge was returned to the second stage softening, also some to the first stage. The split-treatment single-stage comparison at Ames indicated that split-treatment required 10 ppm less lime, 6 ppm less soda ash, 4.29 cu. ft./1000 gal less natural gas (none used with split treatment), and less backwash water or about 15 percent reduction in chemical costs, and produced 20 ppm softer water than the single stage softening process. (Bean-AWWARF)
W72-08873

INFORMATION RESOURCE: WATER POLLUTION CONTROL IN THE WATER UTILITY INDUSTRY,
American Water Works Association Research Foundation, New York.
For primary bibliographic entry see Field 05D.
W72-08983

REVERSE OSMOSIS WATER SOFTENING METHOD AND APPARATUS,
Union Tank Car Co. (Assignee).
For primary bibliographic entry see Field 03A.
W72-09028

RAPID TESTS FOR PATHOGENS IN WATER SUPPLIES.
Susquehanna Corp., Alexandria, Va. Atlantic Research Div.
For primary bibliographic entry see Field 05A.
W72-09109

5G. Water Quality Control

ENVIRONMENTAL GEOMORPHOLOGY.
For primary bibliographic entry see Field 04C.
W72-08510

INSTITUTIONAL ARRANGEMENTS FOR INTERNATIONAL ENVIRONMENTAL COOPERATION.
National Academy of Sciences, Washington, D.C. Environ Mental Studies Board.
For primary bibliographic entry see Field 06E.
W72-08540

EVALUATION OF THE PROJECT DRIBBLE SITE, HATTIESBURG, MISSISSIPPI, FOR DISPOSITION INCLUDING IDENTIFICATION OF RESTRICTIONS,
Teledyne Isotopes, Palo Alto, Calif.
M. C. Gardner, and C. E. Downs.
Available from the National Technical Information Service as NVO-1229-145 (Pt. 1), $3.00 in paper copy, $0.95 in microfiche. March 1971. 49 p, 34 ref.

Descriptors: *Water quality control, *Nuclear wastes, *Radioactivity techniques, Monitoring, Liquid wastes, Aquifer characteristics, Geologic formations, Underground storage, Movement, Sodium chloride, Water wells, Injection, Oil wells, Path of pollutants, Forecasting, Systems analysis, Nuclear explosions.

Fresh water aquifers in the site region have very slow rates of movement such that no radionuclides above concentration guide levels are forecast; however water quality and pressure monitoring is recommended at 5 existing wells and an additional one which should be constructed for this purpose. By applying criteria developed with regard to disposal of the Shoal, Nevada, and Gnome, New Mexico, sites, release for agricultural pursuits is recommended, although drilling and mining must

be excluded from within 600 ft of a waste-disposal well and 300 ft of ground zero. (Bopp-ORNL)
W72-08548

A TECHNICAL EVALUATION OF LAND DISPOSAL OF WASTE WATERS AND THE NEEDS FOR PLANNING AND MONITORING WATER RESOURCES IN DANE COUNTY, WISCONSIN.
Dane County Regional Planning Commission, Madison, Wisconsin, Report of the Water Resources Task Group, December 1971. 165 p. 10 fig, 6 tab, 66 ref.

Descriptors: *Water resources, *Water resources development, *Planning, Management, Water quality, Surface waters, Groundwater, Regional analysis, Water reuse, Waste disposal, Waste water treatment, Comprehensive planning, Eutrophication, Sprinkler irrigation, Sewage effluents, Sewage disposal, Water supply, Water demand, Waste storage, Alternate planning, Urbanization, Public health, *Wisconsin.
Identifiers: *Dane County (Wis), *Waste water management.

A plan for regional water quality management for Dane County, Wisconsin was reviewed in depth by a task group with backgrounds in engineering, chemistry, earth sciences, health sciences, and planning. Proposed waste water recycling by spray irrigation was given particular attention, both as a concept and as a specific proposal. Surface and groundwater pollution should be carefully considered and evaluated in future planning for this recycling scheme. The task group recommendations are: give priority to waste water treatment facilities that protect the quality and maintain the quantity of water resources for present and projected uses; provide opportunities to improve water quality and quantity; and provide opportunities for economic efficiency in the operation of these facilities. Alternative recommendations for consideration in waste water treatment include: advanced waste treatment and water carriage of effluent; treatment, storage and land disposal; and combinations of the two. Systematic planning, periodic replanning and development of comprehensive monitoring systems are also recommended. Specific components to be considered in the planning process are given for the broad areas of water quantity, water quality, environmental and related technical effects as well as economic-social effects, and agronomic effects. (Auen-Wisconsin)
W72-08557

BILLIONS TO SOOTHE THE TROUBLED WATERS,
R. M. Lennart.
Water and Wastes Engineering, Vol. 9, No. 1, p 26-31, January, 1972. 5 tab, 10 ref.

Descriptors: *Estimated costs, *Total costs, *Water pollution control, *Federal government, Legislation, Pollution abatement, Construction costs, Government finance.
Identifiers: *Governmental agencies.

The sources and amounts of current and prospective funds for water pollution control and abatement are discussed. While the trend is to increase these appropriations, a huge backlog of municipal treatment plant construction requirements remains. In spite of the acknowledged hazards of estimation, water pollution control costs as estimated by three sources for the 1970-1975 period were similar. Industrial investment for pollution abatement is expected to increase over this period, while total spending required for major sources of environmental pollution is estimated at $105 billion (1.6% of the cumulative GNP) by the Environmental Protection Agency. Of this total, 23% will go for air pollution control, 36% for water pollution control, and 41% for solid waste management. Funding sources to rely upon are municipal bonds and grants-in-aid from state and federal agencies such as the FWQA, FHA, EDA and HUD. A discussion of the amounts available from these sources and the amounts authorized by federal legislation includes an account of various stumbling blocks to obtaining their full value. (Haugh-Wisconsin)
W72-08598

POLICY MAKING IN THE FIGHT AGAINST WATER POLLUTION, (IN FRENCH),
Secretariat Perma. Etude Probl. Fau, Paris (France).
O. Lacambre, and G. Martin.
Rev Hyg Med Soc. 17 (3): 283-294. 1969. Maps. English summary.
Identifiers: Legislation, Pollution, Treatment.

In the fight against water pollution the following are needed: a national policy which should aim at economy of water, the increase in quantity and quality of the resource, and correct purifying of polluted water; new administrative structures placed throughout the country on the hydrographic reservoirs or their subdivisions; financial measures including the payment of dues by the manufacturers or local communities who pollute the water (to obtain the means to finance the necessary works); and territorial development made concrete by a zoning which determines the setting up of urban communities and factories, in order to supply drinking water and the treatment and evacuation of used water.—Copyright 1972, Biological Abstracts, Inc.
W72-08625

FULL SCALE TESTING OF THE HIGH SEAS OIL CONTAINMENT BARRIER (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Coast Guard, Washington, D.C.

Available from the National Technical Information Service as PB-204 668-D, $3.00 in paper copy, $0.95 in microfiche. November 29, 1971. 15 p.

Descriptors: *Gulf of Mexico, *Environmental effects, *Barriers, *Oil spills, *Oil-water interfaces, Oil pollution, Water pollution, Water pollution sources, Surface waters, Oceans, Surface tension, Water properties, Retention, Surfaces, On-site testing, Evaluation, Research and development, Testing procedures, Soybeans, Oilseed crops, Performance, Contracts, Pollution abatement.
Identifiers: *Environmental impact statements, *Oil containment barriers.

The project involves rough water testing of a mobile, air transportable oil-containment barrier developed by Johns-Manville. The test will be conducted in the Gulf of Mexico about 50 miles south of Mobile, Alabama in seas of 3 to 5 feet. Approximately 900 bbls. of soybean oil will be used, since it is biodegradable and edible and will produce no known adverse reactions should it escape. Safety precautions will be taken to retrieve the oil should it escape from the barrier. Testing in 5-10 foot seas will also be conducted, but without oil. There is no known adverse effect on ecological systems such as wildlife, fish, and other marine life. Procedures will be taken to minimize possible ecological damage, including careful scheduling of test sequences, use of non-toxic soybean oil, selection of a site where currents flow away from problem areas, and coordination with local groups to insure no adverse impact. There are no proposed alternative actions due to the lack of adverse test effects. No long-term effects or irreversible commitments of resources are involved. (Grant-Florida)
W72-08630

TEKAMAH-MUD CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C. Watershed Planning Div.
For primary bibliographic entry see Field 04D.
W72-08632

NEW HOPE LAKE, NORTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 08D.
W72-08639

ENVIRONMENT REPORT/WHITE HOUSE SEEKS TO RESTRICT SCOPE OF ENVIRONMENTAL LAW,
For primary bibliographic entry see Field 06E.
W72-08642

CHANGING TIMES: UNIFORM RULES URGED AS POLLUTION BECOMES A WORLD-WIDE PROBLEM,
For primary bibliographic entry see Field 06E.
W72-08644

GETTING TOUGH: U.S. PRESSURE ON FIRMS TO CLEAN UP WATERWAYS BEGINS TO HAVE IMPACT,
For primary bibliographic entry see Field 06E.
W72-08645

ENVIRONMENT REPORT/INDUSTRIES WIN FEW CONCESSIONS AS POLLUTION PERMIT PLAN MOVES ON SCHEDULE,
For primary bibliographic entry see Field 06E.
W72-08647

EMINENT DOMAIN: PUBLIC PURPOSE AND CONSERVATION OF NATURAL RESOURCES,
P. C. Fawsett.
University of Florida Law Review, Vol. 24, p. 392-396, Winter 1972. 39 ref.

Descriptors: *Florida, *Condemnation, *Water pollution control, *Environmental effects, *Electrical power plants, Natural resources, Judicial decisions, Eminent domain, Jurisdiction, State governments, Land tenure, Legal review, Public rights, Regulation, Project planning, Permits, Conservation, Administrative agencies, Public utilities, Thermal pollution.

The case of Seadade Industries Inc. v. Florida Power and Light Co., 245 So.2d 209 (Fla. 1971), is evaluated. Florida Power and Light condemned Seadade's land by eminent domain to construct a discharge water canal emptying into Biscayne Bay. Seadade resisted, claiming the taking was adverse to the public interest and a gross abuse of the condemning authority's discretion because prior project approval had not been obtained from federal, state, and local pollution authorities. There was evidence that the heated discharge would damage the ecology of Biscayne Bay. The Florida supreme court allowed Florida Power to condemn the land but required it to demonstrate a reasonable probability of obtaining project approval, and that the taking would not result in irreparable harm to natural resources. Seadade was the first judicial attempt to enforce Florida's constitutional policy of protecting the environment. The effect of the holding, however, is unclear. Allowing fee simple condemnation before project approval by conservation agencies is contrary to the view that eminent domain power should be strictly construed. To balance competing interests, the court should require less than a fee simple interest to be taken prior to project approval. (Horwitz-Florida)
W72-08650

CLEAN WATER PACKAGE,
U.S. Congress, Washington, D.C.; and House, Washington, D. C.
For primary bibliographic entry see Field 06E.
W72-08651

WATER POLLUTERS TANGLE WITH THE LAW--AND LOSE.
For primary bibliographic entry see Field 06E.

W72-08656

THE STORMY DEBATE OVER 'ZERO DISCHARGE'.
For primary bibliographic entry see Field 06E.
W72-08657

DUMPING OF WASTE MATERIALS.
For primary bibliographic entry see Field 06E.
W72-08658

TAX INCENTIVES DON'T STOP POLLUTION,
For primary bibliographic entry see Field 06C.
W72-08661

AN ACT RELATING TO WATER POLLUTION CONTROL AND ESTABLISHING THE MINNESOTA STATE WATER POLLUTION CONTROL FUND.
For primary bibliographic entry see Field 06E.
W72-08662

AN ACT RELATING TO POLLUTION CONTROL AND PROHIBITING CLEANING AGENTS AND CHEMICAL WATER CONDITIONERS CONTAINING CERTAIN NUTRIENTS.
For primary bibliographic entry see Field 06E.
W72-08663

EXPANDING THE ROLE OF MUNICIPAL POLICE POWER IN POLLUTION CONTROL: A PRAGMATIC APPROACH,
For primary bibliographic entry see Field 06E.
W72-08664

TYRONE, BLAIR COUNTY, PENNSYLVANIA—LOCAL FLOOD PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W72-08667

THE FUTURE IMPACT OF FOOD INDUSTRY WASTE ON THE WATER QUALITY OF THE STATE OF WASHINGTON,
Washington Univ., Seattle.
B. W. Mar.
Chemical Engineering Progress Symposium Series No. 97, Vol 65, 1969, p 238-245, 8 fig, 2 tab, 14 ref.

Descriptors: *Food processing industry, *Industrial wastes, *Pacific Northwest U.S., Regulation, Water quality control, Planning, Management, *Water quality standards, Biochemical oxygen demand, Coliforms, Waste assimilative capacity, Cost analysis, Waste water treatment, *Washington.
Identifiers: *Enforcement.

The basic elements of a regional water quality analysis are to: (1) establish present and future waste production levels; (2) establish the relationship between waste discharge and water quality; (3) appraise the damages associated with all levels of waste discharge; (4) estimate costs to reduce these damages; and, (5) determine optimum levels of discharge and control of wastes at any time period. The two opposing strategies which must be accounted for in regional waste management schemes are: (1) the control agencies will try to minimize the sum of damage costs related to low water quality and the costs of increased treatment to reduce water quality degradation (efficiency), and to distribute these costs among all users (equity); and (2) the discharger will try to minimize costs associated with waste discharge. Therefore, the major action required in controlling waste discharges is education of the dischargers to the fact that various types of waste reduction are inevitable, thus helping to obtain an orderly transition to controlled waste loading by proper definition of allowable loads, integrated treatment systems, and process modifications. Once the continuous need is demonstrated, the technology of treatment is readily available. (Lowry-Texas)
W72-08694

1971 PROGRAM OF THE GREAT LAKES RESEARCH CENTER.
Lake Survey Center, Detroit, Mich.
For primary bibliographic entry see Field 02H.
W72-08717

PROCEEDINGS OF MEETING ON ENVIRONMENTAL POLLUTION (2ND) 24-25 MARCH 1971, SPONSORED BY AMERICAN ORDNANCE ASSOCIATION.
For primary bibliographic entry see Field 05A.
W72-08736

PESTICIDES IDENTIFICATION AT THE RESIDUE LEVEL.
For primary bibliographic entry see Field 05A.
W72-08738

EARTH RESOURCES,
General Electric Co., Philadelphia, Pa. Missile and Space Div.
For primary bibliographic entry see Field 07C.
W72-08759

AGRICULTURAL IRRIGATION AND SALINE QUALITY OF WATER,
For primary bibliographic entry see Field 06E.
W72-08766

DEZINCIFICATION OF BRASS,
San Diego Dept. of Utilities, Calif.
For primary bibliographic entry see Field 08G.
W72-08795

THE U.S. WATER QUALITY PROGRAM: DESPERATE NEED FOR PLANNING,
E. E. Dallaire.
Civil Engineering - ASCE, Vol 41, No 9, p 63-67, Sept. 1971. 2 fig.

Descriptors: *Water treatment, Sanitary engineering, *Public health, *Sewage treatment, *Waste water disposal, *Research and development, *Planning, Design, *Water reuse, Water pollution control, *Federal government, Water quality, *River basin development.

Continuing on its present course, the federal government could waste billions of taxpayers' dollars over the next decade, in a futile effort to clean up the nation's waters. To stop this waste, the federal government will have to spend much more on R and D and on planning. There is a desperate need for planning for cleaning up all the rivers in the country on a basin-wide basis. At the present time, a 'shotgun' approach to building plants has been undertaken. Effluent charges, together with federal planning monies, would bring about the river-basin approach, the only approach that will clean up the waters. (See also W72-08798) (Bean-AWWARF)
W72-08797

ORGANIC PESTICIDES IN THE AQUATIC ENVIRONMENT,
Missouri Univ., Rolla Rolla. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W72-08799

SEWAGE ODOR CONTROL BY LIQUID-GAS EXTRACTION.
San Diego Water Utilities Dept., Calif.
For primary bibliographic entry see Field 05D.
W72-08825

UNITED STATES V. HERCULES, INC, SUNFLOWER ARMY AMMUNITION PLANT, LAWRENCE, KANSAS, (REFUSE ACT VIOLATIONS).
For primary bibliographic entry see Field 06E.
W72-08830

PAPILLION CREEK AND TRIBUTARIES, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 08A.
W72-08831

LARSON V. VILLAGE OF CAPRON (SEWAGE DRAINAGE BY UPLAND OWNER).
For primary bibliographic entry see Field 06E.
W72-08835

PRESENT MILITARY USES OF THE SEABED AND FORSEEABLE DEVELOPMENTS,
Ministry of Foreign Affairs, Oslo (Norway). Judicial Dept.
For primary bibliographic entry see Field 06E.
W72-08837

ENVIRONMENT REPORT/ECONOMIC ARGUMENTS MAY FORCE RETREAT FROM SENATE WATER-QUALITY GOALS,
C. E. Barfield.
National Journal, Vol. 4, p. 136-147, January 22, 1972. 1 fig, 8 photo.

Descriptors: *Water quality control, *Legislation, *Pollution abatement, *Water pollution control, *Federal government, Waste treatment, Permits, Economic feasibility, Political aspects, Water law, Water pollution, Water quality, Legal aspects, State governments, Regulation, Governmental interrelations, Institutional constraints, Political constraints, Municipal wastes, Industrial wastes, Treatment facilities, Administration, Effluents, Industrial production, Environmental effects.
Identifiers: *Refuse Act, *Zero discharge.

The water quality bill recently passed by the Senate included a 1985 no-discharge goal for industrial pollutants, and it authorized the Environmental Protection Agency to review state permits on a permit-by-permit basis. The bill being considered by the House has become the target of opposition from the Administration and industry, who oppose the standards and enforcement section of the bill, and from state officials challenging the federal government's authority under the permit section. The Administration claims it would cost $316.5 billion to meet the no-discharge pollution requirement; thereby seriously damaging the industrial economy. The House version will probably weaken the no-discharge requirement and repeal the Refuse Act permit program. Rather than allowing a permit-by-permit review of state programs, the Environmental Protection Agency, once it gives permit-granting authority to a state, would have to take over the entire state program if state action were disapproved. Both versions authorize federal financing for improved municipal treatment facilities. The House version is viewed as a setback for environmentalists. (Brackins-Florida)
W72-08839

A TOUGHER DRIVE TO CLEAN UP AIR, WATER.

U.S. News and World Report, Vol. 72, p. 36-37, February 21, 1972. 1 photo.

Descriptors: *Federal government, *Environmental sanitation, *Pollution abatement, *Water pollution control, Air pollution, Effluents, Water pollution, Environmental engineering, Airports,

Highways, Legislation, Administrative agencies, Wildlife conservation, State governments, Projects, Federal project policy, Planning, Industrial wastes, Recycling, Water quality control.
Identifiers: *Zero discharge.

Recent proposals by President Nixon and the Congress for cleaning up the Nation's water and air are evaluated. The Nixon plan ranges from an executive order that bans the use of poisoned bait on public lands to a proposed tax on sulfur oxides. The President would also give the states and the federal government more power to control land use and safeguard undeveloped areas. The 'Muskie Bill' for cleaning up our waters sets step-by-step deadlines to achieve the goal of pollution-free water by 1985. The Nixon Administration is in accord with the 1985 deadline, but it disagrees with the policy of zero discharge. The Administration claims that the cost of eliminating all pollution from effluents would be enormous. The Administration also plans to give industry tax-exempt treatment on bonds for facilities to recycle wastes into usable materials. (Waldron-Florida)
W72-08840

THE EFFECT OF WATER POLLUTION CONTROL LAWS ON THE LOCATION OF PULP AND PAPER MILLS,
Braniff Graduate School of Management, Irving, Tex.
A. H. Montgomery, Jr.
Alabama Business, Vol. 40, No. 11, p. 1-3 and 5-8, July 15, 1970. 5 tab, 17 ref.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Water Quality Act, *Economic impact, Pulp wastes, Cost comparisons, Water quality, Legislation, Waste water treatment, Sites, Water pollution, Water pollution treatment, Costs, Cost analysis, Water pollution sources, Pollution abatement, Water quality control, Federal government, State governments, Alabama, Social impact.

Although state laws were not sufficient to abate pollution from pulp and paper mills, it is difficult to determine quantitatively what effects the Federal Water Qualtiy Act of 1965 has had on such mills. New water pollution control laws will cause a shift in the desirability of various areas as locations for pulp and paper mills. This conclusion should be regarded as tentative due to the lack of complete data in several areas. A study was made of the leading county in each of five states having the greatest concentrations of paper mills. Data were gathered to determine what treatment pulp and paper mills were providing in 1965, and what treatment was now required. These figures were compared with an assumed model mill (generating average amounts of wastes). The results showed that the model mill faced substantial costs in meeting stream standards of the Water Quality Act. Such costs will be significant to a company considering a new location or expansion. (Nielsen-Florida)
W72-08841

U.S. AND CANADA HOLD MEETING ON GREAT LAKES POLLUTION (JOINT COMMUNIQUE).
For primary bibliographic entry see Field 06E.
W72-08842

BRISTOL HARBOR BREAKWATER, BRISTOL HARBOR, RHODE ISLAND (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 08A.
W72-08843

PROPOSED PRINCIPLES AND STANDARDS FOR PLANNING WATER AND LAND RESOURCES (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-08847

WATER POLLUTION CONTROL LEGISLATION, PART 4.
Congress, Washington, D.C.; and Senate, Washington, D.C. Subcommittee on Air and Water Pollution.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.50. Hearings--Subcommittee on Air and Water Pollution--Committee on Public Works, U.S. Senate, 92d Cong, 1st Sess, Part 4, p 1549-1908, general appendix, Section II. 360 p, 3 fig, 13 tab, 1 chart, 106 ref, 1971.

Descriptors: *Water pollution control, *Federal Water Pollution Control Act, *Pollution abatement, *Federal government, Legislation, Legal aspects, Administrative agencies, Political aspects, Comprehensive planning, Institutional constraints, Water policy, Administration, Law enforcement, Impaired water quality, Water pollution sources, Water pollution effects, Grants, Research and development, State governments.

The print of committee hearings held on July 2, 1971 includes a staff working print of pending federal water pollution control amendments and comments on these amendments from industry, states, and private individuals. Comments from industry indicate that a practical implementation program of stream quality criteria should not and need not include continuous or frequent monitoring. There is industry objection to establishment of national minimum water quality standards, federal control over ground waters and disposal of materials in wells, and damage provisions which may expose persons discharging prohibited substances to double liability. State comments included objections to amendment sections which require continuous, yearly acceleration of state spending as a prerequisite to obtaining federal program grants, and the establishment of federal effluent standard and permit systems rather than state permit systems. The report also contains Environmental Protection Agency memoranda concerning current agency policy with respect to establishing specific effluent limitations in permits. (Blank-Florida)
W72-08851

THE VITALITY OF THE NAVIGABILITY CRITERION IN THE ERA OF ENVIRONMENTALISM,
For primary bibliographic entry see Field 06E.
W72-08854

THE TOXICITY OF TEN ORGANIC INSECTICIDES TO VARIOUS AQUATIC INVERTEBRATES,
Utah Univ., Salt Lake City. Dept. of Zoology and Entomology.
For primary bibliographic entry see Field 05C.
W72-08857

WATER CONSERVATION BY BARRIER INJECTION,
Nassau County Dept. of Public Works, Long Island, N.Y.
J. H. Peters, and D. Cuming.
Water and Sewage Works, Vol 114, No 2, p 63-68, February 1967. 3 fig, 1 tab.

Descriptors: Sanitary engineering, *Water reuse, *Water conservation, *Water supply, Groundwater barriers, *Saline water barriers, *Injection, *Saline water intrusion.

River flows in the U.S. approximate 6,000 gallons per day for every person, yet many areas suffer shortages of water. In some areas this is caused by fresh water, on or near the surface, flowing to the sea. Water drawn for use from the ground then becomes salty due to ocean water intruding to the deeper well areas. Nassau County on Long Island is such an area. Studies and plans for the creation of a water barrier to prevent the intrusion of sea water are described. This barrier will be provided by the injection of renovated waters along a line paralleling the ocean shoreline. (Bean-AWWARF)
W72-08861

BIOASSAYS DETERMINE PESTICIDE TOXICITY TO AQUATIC INVERTEBRATES,
Utah Univ., Salt Lake City. Dept. of Zoology and Entomology.
For primary bibliographic entry see Field 05C.
W72-08862

ABRIDGED BIBLIOGRAPHY. ECONOMICS OF WATER QUALITY--SALINITY POLLUTION,
Colorado State Univ., Fort Collins. Dept. of Economics.
C. A. Miller.
Environmental Resources Center Information Series No 2 June 1971. 154 p, OWRR B-042-COLO (1).

Descriptors: *Salinity, *Bibliographies, *Water pollution, *Colorado River, *Economic impact, *Computer programs, Data storage and retrieval, Libraries.

This bibliography of approximately 360 citations was extracted from a microfiche library of 400 documents and was developed as part of an economic water quality study. The references relate to the economic impacts of salinity pollution; also included are many references to physical and biological aspects of salinity pollution. It should be particularly useful for anyone interested in the salinity problems of the Colorado Basin and especially the Grand Valley area of the upper basin. The bibliography contains 4 sections--author, title, source and master lists--which were generated and printed out by a computer library routine, reduced and reproduced as originally printed. (Casey-Arizona)
W72-08883

USE AND RE-USE OF INLAND WATERS,
National Capital Development Commission, Canberra (Australia).
C. J. Price.
Ecological Society of Australia, Proceedings, Vol. 5, p. 113-121, 1970.

Descriptors: *River basins, *Urban drainage, *Arid lands, *Water conservation, *Water reuse, Recreation facilities, Reservoir operation, Water quality control, Economic feasibility.

Any consideration of water use and reuse in Australia must recognize that it is an arid continent. Some 1/3 of the nation may be regarded as desert. The large communities on inland waterways have water shortages, although the coastal centers, with reasonably abundant water sources are beginning to feel a pinch also. Canberra is the national capital and the largest inland city in Australia and is a planned garden community in a relatively low rainfall area with low humidity and consequent high evaporation. The city is growing rapidly in population and cannot afford to waste water by wasteful consumption, quality deterioration or by misuse. The limited water sources of the area are described. Measures have been undertaken to ensure the widest possible utility of the available water supplies such as the development of municipal reservoirs into recreation areas. Various forms of proposed reuse are reviewed. Some river basins such as the Ruhr Valley have faced and dealt with many of the same water problems as Australia, so their practices are reviewed also. The conclusions are: (1) a positive approach to optimum use of water as a valuable but limited resource is the safeguard against pollution of both the stream and its environment; (2) this approach cannot be effective unless there is cooperation among all social levels ranging from the conservationist to the developer. (Casey-Arizona)
W72-08887

SOME ENVIRONMENTAL CONSIDERATIONS IN THE SITING OF NUCLEAR POWER REACTORS ALONG THE CALIFORNIA COAST,
California Univ., Santa Barbara. Dept. of Geography.
For primary bibliographic entry see Field 06G.
W72-08896

GLOBAL CLIMATE CHANGE AND THE IMPACT OF A MAXIMUM SEA LEVEL ON COASTAL SETTLEMENT,
North Carolina Univ., Chapel Hill. Dept. of Geography.
For primary bibliographic entry see Field 06G.
W72-08902

AIR BARRIERS AS OIL-SPILL CONTAINMENT DEVICES,
Shell Pipe Line Corp., Houston, Tex.
W. T. Jones.
Society of Petroleum Engineers Journal, Vol 12, No 2, p 126-142, April 1972. 26 fig, 4 tab, 42 ref, append.

Descriptors: *Oil water, *Oil spills, *Water pollution treatment, *Bubbles, *Oil pollution, Water pollution control, Turbulence, Aeration, Water circulation, Currents (Water), Mixing, Dispersion.
Identifiers: *Oil spill treatment, *Air barriers (Oil spills).

An experimental investigation of air barriers was performed and previously published relationships for air barriers operating in still water were verified. The structure of the bubble plume changed with increasing current. Tests with oil on the water surface showed turbulence to be the major factor in the failure of an air barrier completely to retain oil in the presence of a current. The combination of turbulence and the inherent instability of flowing, stratified fluids tears drops off the bottom of the oil slick in the stagnation region. The downward flow in this region then transports the oil drops below the surface current produced by the air barrier, and the main current carries the drops through the barrier. On the downstream side, the drops gradually rise to the surface. Varying orifice size and spacing had no effect on the surface current turbulence or mean velocity. Large quantities of spilled oil have been recovered at a prototype installation by placing the barrier at an angle to the current. Limits on the use of this formulation for prototype spills are given. (Knapp-USGS)
W72-08945

THE RELATIONSHIP BETWEEN HOUSING AND WATER RESOURCES PLANNING AND MANAGEMENT,
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
W. M. Hanemann, and S. Bhotiwihok.
Available from the National Technical Information Service as PB-209 801. Completion Report, March 1, 1972, 394 p, 171 ref. OWRR C-2114 (No. 3399) (1).

Descriptors: *Urbanization, *Water supply, *Water demand, *Sewerage, *Septic tanks, *Public utilities, *Local Governments, Cities, Institutions, Political aspects, Planning, Federal Government, Grants, Land use, Regression analysis, Spatial distribution, Construction costs, Economies of scale, Massachusetts, Arizona, Florida.
Identifiers: *Housing, *Boston, *Miami, *Phoenix, *Tuscon.

A description is presented on how water and sewer services are provided for new housing development in suburban areas around Boston, Miami, Phoenix, and Tuscon planning procedures, government regulations, and water and sewer costs are compared. In general, the availability of public water or sewer services was not a major influence on the location of new housing; but, around Phoenix, institutional obstacles to the transfer of water from agricultural to urban areas may hinder future growth. There is evidence that housing development had some adverse effects on water and sewer systems, through the development of inefficient networks and pollution from septic tanks and overloaded treatment plants. These could have been prevented with more stringent regulation by state and local government agencies. The impact of regional planning councils and of federal water and sewer grant programs is examined and modifications to the HUD grant program to increase its effectiveness are recommended. In separate econometric studies prediction equations are developed for water network costs using a new index which measures the shape and population distribution of an urban area; the determinants of water consumption are investigated, and multi-family housing tends to reduce per capita consumption are shown.
W72-08952

NEW TRENDS IN WATER-RESOURCES DEVELOPMENT,
Wright-McLaughlin Engineers, Denver, Colo.
K. R. Wright.
Journal of the American Water Works Association, Vol. 63, No. 9, p 787-788, September 1971. 1 photo, 7 ref.

Descriptors. *Water resources development, *Planning, *Environment, *Water quality control, Reclamation, Sewage effluents, Conservation, Water reuse.
Identifiers: *Development trends, *Planning principles, Synergistic approach.

Among the trends in water resources development are: (1) a change which will replace water resources development by a water resources management approach, and (2) a change in the role of the engineer. Municipal water resources development must cease to be a single-purpose-single-function projects, conceived by the engineer as a provider and conveyor of potable water. The new urban water resources manager must direct his energy in a synergistic approach that includes: sewage effluent reuse; the capture, recharge and utilization of storm runoff; the recycling of industrial water within a plant; and the elimination of large water needs for cooling purposes, coupled with conjunctive use of surface water supplies and ground water in a balanced manner. The most significant trend in water resources development is located in the method of reuse and reclamation of sewage effluent. Three environmental planning principles must be remembered in any attempt to conserve or develop the environment. (1) The environment is a single system. (2) The environment is a closed system. (3) Pollutants are out-of-place resources. (Strachan-Chicago)
W72-08960

NATIONAL IRRIGATION RETURN FLOW RESEARCH AND DEVELOPMENT PROGRAM,
Robert S. Kerr Water Research Center, Ida, Okla.
J. P. Law, Jr.
Copy available from GPO Sup Doc, $0.40; microfiche from NTIS as PB-209 857, $0.95. Water Pollution Control Research Series, Environmental Protection Agency, December 1971, 23 p, 2 fig, 1 tab, 11 ref. EPA Program EP2:10, 13030 GJS 12/71.

Descriptors: *Water quality control, *Irrigation effects, Pollution abatement, *Return flow, Waste water (Pollution), Programs, Research and development, Research priorities, Water quality control, Farm wastes.

The status of the National Irrigation Return Flow Research and Development Program is presented. Current research projects and future program development are discussed. The report represents the position of the Environmental Protection Agency (EPA) with regard to the development of effective controls on the quality of irrigation return flows. Program goals and milestones are outlined. A number of potential control measures are discussed. Improvements in the water delivery system, on-the-farm water management, and the water removal system are considered with respect to improving the quality of irrigation return flows and decreasing the degradation of receiving waters. Research and investigations are needed to evaluate the effectiveness of potential control measures. Demonstrations and educational activities will be required to overcome institutional, political, and legal constraints to water management reform. (EPA abstract)
W72-08980

MANAGEMENT OF NUTRIENTS ON AGRICULTURAL LAND FOR IMPROVED WATER QUALITY.
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W72-08981

REAL-ESTATE LAKES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 03D.
W72-08997

SEALING OF UNDERWATER FISSURES,
S. W. Miranda.
U. S. Patent No. 3,643,741, 3 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol. 895, No. 4, p 1348, February 22, 1972.

Descriptors: *Patents, *Oil pollution, Sea water, Pollution abatement, Water pollution treatment, Water pollution, Separation techniques, Equipment, Sealants, Leakage, *Fissures (Geologic), Oceans.
Identifiers: Ocean floor.

Three provisions are offered to control oil flow from fissures on the ocean floor. A resin-forming liquid is applied to the fissure and cures in place binding the oil to form a body of sealant adhering to the walls of the fissure. A secondary channel may be drilled on a slant into the fissure at a location below the ocean floor and the resin pumped through it to seal the fissure. A dome is placed over the fissure, anchored and sealed to the floor to stop the oil leakage. A pipe may be topped into the dome to remove the accumulated oil. (Sinha-OEIS)
W72-09017

OIL RECOVERY AND CLEANUP SYSTEM,
J. H. Parker.
U. S. Patent No. 3,642,140, 7 p, 11 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 895, No. 3, p 923, February 15, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Equipment, Pollution abatement, Water pollution treatment, Separation techniques.

An oil recovery unit is in the form of an assembly of float elements which are of decreasing diameter from top to bottom. An oil collection device is centrally positioned so that the oily mixture is passed into the collection chamber wherein it is able to settle into an oil phase and a water phase. The water phase is passed at low velocity through at least two other processing stages to remove entrained oil and to discharge the water. The oil phase is passed to a collection zone for subsequent removal. (Sinha-OEIS)
W72-09018

APPARATUS FOR PREVENTING OIL POLLUTION,
Texaco Inc., New York. (Assignee).
R. Tuggle, R. H. Graves, and R. J. De Rouen.
U. S. Patent No. 3,638,796, 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 895, No. 1, p 150, February 1, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Pollution abatement, Water pollution treatment, Water pollution, Equipment, Separation techniques, *Caissons.

The apparatus consists of caisson situated in an upright position and extending above the highest level of the water surface to prevent wave action from causing the mixture of the oil and water. The caisson reaches into the subsurface of the body of water. A pipe is placed within the caisson to receive the input fluid that may contain oil. This apparatus is applicable specifically to petroleum producing operations located inland or in offshore waters. (Sinha-OEIS)
W72-09022

HIGH-STRENGTH FIRE-RESISTANT SPILL CONTROL BOOMS,
M. F. Smith.
U. S. Patent No. 3,638,430, 4 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 895, No. 1, p 57, February 1, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Pollution abatement, Water pollution treatment, Water pollution, Equipment, Separation techniques, Barriers.
Identifiers: *Booms, Floating booms.

High-strength fire-resistant floating barriers are provided for the control of floating spilled materials. The barrier is suitable for deployment between a dock and a vessel. The barrier fin has elongated upper and lower edges extending over the length of the boom. A knitted reinforcing and tensile load-distribution mesh connects with buoyant float blocks which have liquid-impervious outer surfaces anchored at spaced accordion-foldable intervals along the upper edge of the flexible fin. (Sinha-OEIS)
W72-09023

INTERNATIONAL ENVIRONMENTAL DAMAGE CONTROL: SOME PROPOSALS FOR THE SECOND BEST OF ALL POSSIBLE WORLDS,
Kentucky Univ., Lexington. School of Law.
For primary bibliographic entry see Field 06G.
W72-09030

THE POLLUTION PROBLEM AND LEGAL INSTITUTIONS: A CONCEPTUAL OVERVIEW,
California Univ., Los Angeles. School of Law.
J. E. Krier.
UCLA Law Review, Vol. 18, p 429-477, 1971. 141 ref.

Descriptors: *Economic impact, *Social aspects, *Pollution abatement, *Political constraints, Institutional constraints, Legal aspects, Political aspects, Legislation, Institutions, Research priorities, Administrative agencies, Regulation, Pollution taxes (Charges), Water pollution, Air pollution, Grants, Pricing.
Identifiers: *Absolute liability, *Nuisance (Legal aspects).

Pollution control problems generally can only be solved by some form of government intervention because ordinary market forces do not encourage pollution abatement. Contrasts are presented of some recent economic thinking relating to the internalization of the social cost of pollution with the externalization of such costs which traditionally result from market forces. The social cost is also analyzed in respect to the political process, decision making criteria, and institutional restraints. Environmental litigation objectives discussed include: internalization of costs by imposing liability on the polluter, improvement of private and public decision-making, and defining new issues. Shortcomings and palliatives of the legal aspect of the problem are discussed including problems of proof and problems inherent in the judicial process. The philosophy behind pollution control legislation and administration is analyzed. Three approaches are possible: regulation; subsidies; and charges, prices, or effluent fees. Regulation has been the typical approach because of a lack of understanding how social and economic systems can be used. Pricing is the most desirable control technique. (Grant-Florida)
W72-09031

SMALL FLOOD PROTECTION PROJECT, NORTH FORK, NOLIN RIVER HODGENVILLE, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 04A.
W72-09033

THE CLEAN WATER PACKAGE OF AMENDMENTS TO H.R. 11896,
Congress, Washington, D. C.; and House, Washington, D. C.
For primary bibliographic entry see Field 06E.
W72-09037

AMERICAN WATERWAYS, INC. V. ASKEW (STATE POLLUTION CONTROL LEGISLATION AS AN INFRINGEMENT ON MARITIME UNIFORMITY).
For primary bibliographic entry see Field 06E.
W72-09039

GREAT LAKES CONNECTING CHANNELS--WIDENING AND DEEPENING BENDS IN ST. MARYS RIVER, MICHIGAN--PHASE I (FINAL ENVIRONMENTAL IMPACT STATEMENT).
United States Lake Survey, Detroit, Mich.
For primary bibliographic entry see Field 04A.
W72-09043

THANKS TO CONGRESS, MANY FIRMS FINANACE POLLUTION CONTROL WITH TAX-EXEMPT BONDS,
For primary bibliographic entry see Field 06E.
W72-09045

COMING GOVERNMENT MOVES IN WAR AGAINST POLLUTION (INTERVIEW WITH WILLIAM D. RUCKELSHAUS, ADMINISTRATOR, ENVIRONMENTAL PROTECTION AGENCY).
For primary bibliographic entry see Field 06E.
W72-09047

HOUSTON SHIP CHANNEL, TEXAS-MAINTENANCE DREDGING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 04A.
W72-09055

SOME ECOLOGICAL EFFECTS OF ARTIFICIAL CIRCULATION ON A SMALL EUTROPHIC NEW HAMPSHIRE LAKE,
New Hampshire Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-09061

PULP MILL INTERNAL-EXTERNAL POLLUTION CONTROL ECONOMIC MODELLING FOR RECEIVING WATER PROTECTION,
EKONO, Seattle, Wash.
For primary bibliographic entry see Field 06A.
W72-09070

A NONLINEAR MATHEMATICAL PROGRAMMING MODEL FOR WATER QUALITY MANAGEMENT,
Calgary Univ. (Alberta).
For primary bibliographic entry see Field 06A.
W72-09074

MINIMUM COST REGIONAL POLLUTION CONTROL SYSTEMS,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 06A.
W72-09075

WATER QUALITY MODELING FOR FORECASTIVE AND PLANNING PURPOSES,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 06A.
W72-09078

A MODEL FOR A WATER QUALITY MANAGEMENT STUDY,
Systems Research Group, Inc., Toronto (Ontario).
For primary bibliographic entry see Field 06A.
W72-09084

LEGAL ASPECTS OF WATER POLLUTION IN NEW ENGLAND: A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from the National Technical Information Service as PB-209 812. Water Resources Scientific Information Center, WRSIC 71-213. October 1971. 165 p.

Descriptors: *New England, *Water law, *Legal aspects, *Bibliographies, *Water pollution control, Abstracts, Information retrieval, Water pollution, Judicial decisions, Legislation, Publications, Regulation, Water quality control, Pollution abatement, Water quality standards, Northeast U.S., Data collections, Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont.

Abstracts of judicial decisions, legislation, regulations, and legally related publications, pertaining to water pollution in New England, are presented in this bibliography. The bibliography is one of a series produced wholly from Selected Water Resources Abstracts. Materials relating to Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, and other jurisdictions are presented. Bibliographical details and availability data are listed. A significant descriptor index and a comprehensive index are included. (Johnson-Florida)
W72-09094

REPORT ON PESTICIDE FORMULATIONS,
Environmental Protection Agency, Washington, D.C. Pesticides Regulation Div.
For primary bibliographic entry see Field 05A.
W72-09118

LABORATORY RELEASE RATES OF ENCAPSULATED MALATHION SLOW RELEASE FORMULATIONS, APRIL-JUNE 1971,
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
L. L. Nelson.
Entomological Special Study No. 31-017-71/72, 5 p, 2 tab, 5 ref.

Descriptors: *Pesticide residues, *Persistence, Insecticides, Pesticide toxicity, Pesticide kinetics, Water pollution sources, Laboratory tests, Pesticides, Larvicides, Lethal limit, Water analysis, Formulation, Gas chromatography, Mosquitoes, Evaluation, Flame photometry.
Identifiers: *Malathion, Pesticide encapsulation, Release rates, AC 591, Pennwalt 3527-115, Pennwalt 3527-118, Anopheles quadrimaculatus, Culex pipiens quinquefasciatus, Flame detectors, Encapsulated formulations, Diethyl mercaptosuccinate, Aedes aegypti, Gas liquid chromatography.

Laboratory evaluations were conducted, over an 8-week period, to determine residue levels of

malathion (diethyl mercaptosuccinate, S-ester with 0,0dimethyl phosphorodithioate) maintained in water treated with encapsulated formulations designated AC 591, Pennwalt 3527-115, and Pennwalt 3527-118. Samples were extracted by partitioning with Nanograde (trademark) hexane and analyzed by flame photometric gas-liquid chromatography without additional cleanup. All formulations, at a dose rate of 22.0 ppm active ingredient, were effective in maintaining residues over the entire test period. The Pennwalt 3527-118 formulation released very rapidly with an average of 19.427 ppm detected 1 week post treatment and as a result, is not recommended for further evaluations. The AC 591 and Pennwalt 3527-115 encapsulated malathion formulations should be considered for further evaluations under field conditions. (See also W72-09124) (Mackan-Battelle)
W72-09123

LABORATORY EVALUATION OF RESIDUE LEVELS IN WATER TREATED WITH AN ENCAPSULATED MALATHION FORMULATION, JULY-SEPTEMBER 1971,
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
M. A. Lawson.
Available from the National Technical Information Service as AD-733 914, $3.00 in paper copy, $0.95 in microfiche. Entomological Special Study No. 31-004-72, 4 p, 1 fig, 4 ref.

Descriptors: *Pesticide residues, *Persistence, Pesticides, Insecticides, Pesticide kinetics, Water pollution sources, Laboratory tests, Water analysis, Lethal limit, Formulation, Mosquitoes, Separation techniques, Degradation (Decomposition), Flame photometry.
Identifiers: *Malathion, *Gas liquid chromatography, Release rates, Flame detectors, Pesticide encapsulation, Diethyl mercaptosuccinate, 3MCAP-M, Encapsulated formulations, Anopheles quadrimaculatus, Aedes aegypti, Culex pipiens quinquefasciatus.

Laboratory evaluations were conducted, over an 8-week test period, to determine residue levels of malathion (diethyl mercaptosuccinate, S equals ester with 0,0-dimethyl phosphorodithioate) maintained in water treated with an encapsulated formulation. The encapsulated malathion formulation was tested at rates of 2.5 and 5.0 ppm active ingredients. Samples were extracted by partioning with Nanograde (trademark) hexane and analyzed by flame photometric gas-liquid chromatography without additional cleanup. The recovery with the described method was 100 percent based on known additions. (See also W72-09123) (Mackan-Battelle)
W72-09124

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

THE RELATIONSHIP BETWEEN HOUSING AND WATER RESOURCES PLANNING AND MANAGEMENT,
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W72-08952

WATER RESOURCES AND THE ENVIRONMENT,
National Water Commission, Arlington, Va.
T. M. Schad.
Water Resources Bulletin, Vol. 8, No. 2, p 404-409, April 1972.

Descriptors: *National Water Commission, *Resources development, *Environment, *Long-term planning, Research and development, Quality control, Landscaping, Water users, Recycling, Legal aspects, Values.
Identifiers: *Policy making, *Problem solving, Background knowledge, Water development.

The work of the National Water Commission is discussed. The job of the Commission is to study the Nation's water needs and water problems, and to recommend improved national policies so that future needs for water (and water-related services) may be efficiently met, giving proper attention to aesthetic, economic, and institutional influences. The commission is composed of distinguished persons drawn from outside the federal government, and has the advantage of a broad perspective. The Commission's two tasks are to develop a background of understanding of the Nation's water problems and to recommend solutions. The background phase is almost completed. Two general notions have defined the outline of the study program: the subordination of technical issues to policy issues, and the prominence of the concept of alternative futures. The five studies which have been undertaken to develop a background for the Commission include studies of: (1) water development and environmental quality, (2) the role of water in the landscape, (3) the classification and designation of water for specific uses, (4) the effects of recycling on natural ecosystems, and (5) the legal aspects of accommodating water resources development and environmental values. When the reports of all these studies are completed, the National Water Commission staff will develop recommendations for the consideration of the Commission. (Strachan-Chicago)
W72-08954

MATHEMATICAL MODELS: PLANNING TOOLS FOR THE GREAT LAKES,
Michigan State Univ., East Lansing; and Great Lakes Basin Commission, Ann Arbor, Mich.
S. B. Upchurch, and D. C. N. Robb.
Water Resources Bulletin, Paper No. 72031, Vol. 8, No. 2, p 338-348, April 1972. 3 tab, 4 fig, 14 ref.

Descriptors: *Planning, *Mathematical models, *Great Lakes, Resource development, Feasibility studies, Design standards, Data collection, Quality control, Environment, Evaluation.
Identifiers: *Great Lakes Basin Commission, *Objective planning, Plan development, Planning tools.

The Great Lakes Basin Commission has initiated a Framework Study to assess the present and projected water- and related land-resource problems and demands in the Great Lakes Basin. Poorly defined objectives; incompleted and inconsistent data arrays; unknown air, biota, water, and sediment interactions; and multiple planning considerations for interconnected, large lake systems hinder objective planning. To incorporate mathematical modeling as a planning tool for the Great Lakes, a two-phase program, comprising a feasibility and design study followed by contracted and in-house modeling, data assembly, and plan development, has been initiated. The models will be used to identify sensitivities of the lakes to planning and management alternatives, insufficiencies in the data base, an inadequately understood ecosystem interactions. For the first time objective testing of resource-utilization plans to identify potential conflicts will provide a rational and cost-effective approach to Great Lakes management. Because disciplines will be interrelated, the long-term effects of planning alternatives and their impacts on neighboring lakes and states can be evaluated. Testing of the consequences of environmental accidents and increased pollution levels can be evaluated, and risks to the resource determined. Examples are cited to demonstrate the use of such planning tools. (Strachan-Chicago)
W72-08971

A LINEAR ANALYSIS OF AN URBAN WATER SUPPLY SYSTEM,
Nebraska Soil and Water Conservation Commission, Lincoln.
S. K. Hoppel, and W. Viessman, Jr.
Water Resources Bulletin, Paper No. 72027, Vol. 8, No. 2, p 304-311, April 1972. 2 tab, 3 fig, 7 ref.

Descriptors: *City planning, *Water supply, *Linear programming, Analysis, Costs, Constraints, Long-term planning, Water demand, Short-term planning, Economics, Nebraska.
Identifiers: *Linear analysis, Long-range development, Lincoln (Neb).

The use of linear programming as a planning tool for determining the optimal long-range development of an urban water supply system was explored. A stochastic trace of water demand was synthesized and used as an input to the model. This permitted evaluating the feasibility of imposing demand restriction as an effective cost reduction mechanism. The City of Lincoln, Nebraska, was used as the urban model. The fundamental problem was to allocate limited water supplies from several sources to an urban load center to minimize costs and comply with system constraints. The study period covered twenty years, and findings indicate the planning direction for stage development during this period. Sensitivity analyses were performed on cost-coefficients and demands. Thirteen sources were included in the initial computations. Conclusions were that linear programming and generated demand traces are useful tools for both short- and long-term urban water supply planning. Lowering peak demands results in long-range development of fewer sources of supply and more economic and efficient use of the supplies developed. (Strachan-Chicago)
W72-08977

OPTIMAL DESIGN AND OPERATION OF WATER RESERVOIRS,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 04A.
W72-09062

OPTIMIZATION IN DESIGN OF HYDRAULIC NETWORKS, - DISCUSSION BY GRAHAME G. BOYNE.
Scottish Gas Board, Edinburgh.

Journal of the Sanitary Engineering Division, American Society of Civil Engineers Discussion, Vol 97, No SA6, p 945-946, December 1971. 2 ref.

Descriptors: *Optimization, *Network design, *Hydraulic systems, *Economic efficiency, Head loss, Analytical techniques, Sequential generation.

The particular optimization procedure used in the paper by A. K. Deb and A. K. Sarkar (See W71-06583) on hydraulic network optimization was criticized on the grounds that it could not achieve the global minimum cost solution because of the necessity to predetermine the head losses in the pipes before the procedure could be used. The discussant suggested that the limitations of the procedure could be overcome by applying a nonlinear programming procedure which was formulated to solve the optimum gas network problem to hydraulic network design problems. The nonlinear programming method reduces the number of system variables and constraints by incorporating a network analysis technique. The problem solution is found by generating sets of initial diameter sizes by sampling within the feasible region. The method selects the lowest cost local optimum solution as the global optimum solution. (Markell-Cornell)
W72-09064

MODELLING TECHNIQUES IN WATER RESOURCES SYSTEMS.
International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. Proceedings Vol. 2, (1972). A. K. Biswas, editor, Canada Dept. of the environment. 240 p.

Descriptors: *Model studies, *Mathematical models, *Computers, *Planning, *Management, *Decision making, *Simulation analysis, *Systems analysis.

Since the first computer simulation of a simplified river basin in 1962, much progress has been made in the application of modeling techniques to water resources policy planning and decision making. Scientists from every branch of this field came from all over the world to meet in a symposium to share and communicate their most recent findings. In this second volume, 19 articles present various aspects of current model studies. Optimization studies using linear and dynamic programming are presented, as well as stochastic model simulation studies. They cover a broad area of water policy planning, including effluent plant treatment of a pulp mill, flood plain management, and discussion of the importance of political feasibility in choosing alternative water resources planning objectives. (See W72-08258 and W72-09066 thru W72-09084) (Bell-Cornell)
W72-09065

FINDING NATURAL RECHARGE PATTERNS AND ABSTRACTION PHASES TO MAXIMISE YIELD OF AQUIFERS,
Water Research Association, Marlow (England). Resources Group.
J. A. Cole, H. Hirsch, and B. M. Thorn.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972, p 240-249. 3 fig, 10 ref.

Descriptors: *Aquifers, *Natural recharge, *Analog models, *Artificial recharge, Optimization, Infiltration, Water table, Springs, Wells, Pumping, Groundwater.
Identifiers: Well water level.

Identification of a unit hydrograph response of well water level is presented as a means of detecting sequences of natural recharge to aquifers. This method yields a key to the quantity of infiltration arriving at the water table itself, as distinct from its earlier departure from the root zone of soil. A simple electrical analogue is then used to simulate a block of unconfined aquifer. Various seasonal patterns of natural and artificial recharge can be represented. For each set of boundary conditions the annual groundwater yield is found as a function of pumping phase, i.e. the timing of pumping relative to the recharge pattern. Results are presented as families of graphs and reveal the amount of recharge that may be captured for any pumping phase. (See also W72-09065) (Bell-Cornell)
W72-09066

THE SERIAL CORRELATION IN A SIMPLE DAM PROCESS,
Goteborg Univ. (Sweden).
N. Blomqvist.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972, p 250-263. 2 tab, 8 ref.

Descriptors: *Systems analysis, *Dams, *Queueing theory, Correlation analysis, Simulation analysis, Mathematical models.
Identifiers: Moran model.

In the study of dynamic systems it is often of interest to know the correlation structure of the stochastic process formed by an out-put variable, particularly in the case of simulation experiments. The single-channel queue is studied from the point of view of process correlation aspects. The chosen model differs somewhat from Moran's model which states that the input shall be added to the storage before the end of the period and the demand is a constant. In this case a recursive formula holds. The chosen model defines a random walk with two reflecting barriers. The corresponding single-barrier random walk describes a single-channel waiting time process where the correlation properties are fairly well known. Proceeding from the queueing model to the dam model should therefore make possible some useful comparisons. (See also W72-09065) (Bell-Cornell)
W72-09067

USE OF A PRICING MODEL FOR EFFICIENT WATER SUPPLY ALLOCATION,
Kansas Water Resources Research Inst., Manhattan.
G. S. Clausen.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972, p 264-273. 1 fig, 5 tab, 5 ref. OWRR A-010-ARIZ (21) and B-007-ARIZ (23).

Descriptors: *Arizona, *Colorado River, *Water utilization, *Water supply, *Water demand, *Prices, *Mathematical models, *Optimization, Groundwater, Basins, Reservoirs, Water table, Aquifers.
Identifiers: *Tucson Basin, *Avra Valley, Demand curves.

Water resources management programs should be based on economic analyses which acknowledge that people will use less water at higher prices than they will at lower prices. This fact is expressed as a demand curve and is incorporated into a quantitative analysis of a water supply allocation problem in the Tucson Basin. This area's water supply is pumped entirely from the groundwater reservoir within the basin at a rate exceeding the average annual recharge, and alternative sources are all more expensive to obtain. In this study, a quadratic programming model is developed which maximizes net gains to a publicly controlled water-distribution agency, specifying constraints allowing for limits on water availability and for social limits on water price fluctuation. Study results indicate: A policy that increases the price of public water reduces the rate of withdrawal from the principal aquifer. (See also W72-09065) (Bell-Cornell)
W72-09068

MODELLING DECISION EFFECTIVENESS APPLICATION TO WATER RESOURCE SYSTEMS,
Michigan Univ., Ann Arbor. School of Natural Resources.
J. W. Bulkley.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 274-288, 21 ref.

Descriptors: *Decision making, *Water resources, *Political aspects, *Social needs, *Computer models, Operations research, Mathematical models.
Identifiers: *Maass model, *Political feasibility, *Acceptability, *Quality, *Gaming-simulation.

Two constituents are required to measure the effectiveness of water resource decisions: (1) A quality component, representing the technological engineering aspects; and (2) an acceptability component, primarily representing political feasibility. Water project planning decisions cannot be made efficiently without considering both constituents. Modelling techniques have been developed and used successfully to evaluate economic and technical feasibility; methods for implementing political considerations into the decision-making process are badly needed. This study focuses upon the progress which has been made most recently of representing in abstract form the political component of water resource decisions. It is limited to developments since the publication of the Maass classic model. Three methods for modelling the political feasibility are discussed: Gaming-Simulation, Computer Simulation, and Mathematical modelling. (See also W72-09065) (Bell-Cornell)
W72-09069

PULP MILL INTERNAL-EXTERNAL POLLUTION CONTROL ECONOMIC MODELLING FOR RECEIVING WATER PROTECTION,
EKONO, Seattle, Wash.
H. Edde, and E. N. Westerberg.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972, p 289-308. 8 fig, 3 tab, 8 ref.

Descriptors: *Water pollution control, *Simulation analysis, *Optimization, *Pollutants, *Pulp and paper industry, Mills, Pulp wastes, Solid wastes, Systems analysis, Biochemical oxygen demand, Digital computers.
Identifiers: Dry solids recovery.

The cost and efficiency of an effluent treatment plant depend upon the type and quantity of effluents which it receives. Presented is a method of economic evaluation for environmental protection measures. Examining a pulp mill production operation, a method is developed to aid in the decision of where investment in water pollution control measures can be accomplished at least cost to meet a specific set of regulatory standards. A simulation model generates investment and operating cost data for any configuration of process units and operating parameters for both internal and external pollution control measures. Results indicate that in many cases a combination of internal and external treatment will yield the greatest economic returns. Also, the combination will have 'fail-safe' equalization capabilities thus providing higher quality pollution protection. (See also W72-09065) (Bell-Cornell)
W72-09070

ESTIMATING THE POLITICAL FEASIBILITY OF ALTERNATIVE WATER-RESOURCE PLANS,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
D. A. Haith, and D. P. Loucks.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 309-318, 9 ref. OWRR C-1640 (No. 3151) (5).

Descriptors: *Water resources, *Alternative planning, *Political aspects, *Decision making, Systems analysis, Mathematical models, Feasibility studies, Estimating, Evaluation.
Identifiers: Indifference analysis, Decision theory.

Although technical and financial considerations are vital to any water-resource planning operation, political feasibility must be considered in evaluating the alternative objectives. The final selection of a planning alternative for implementation is most always a political decision, wherein the goals of certain groups of policy makers or members of a community are either considered, rejected, or compromised in the process. A probabilistic form of indifference analysis is used to identify important planning objectives and to estimate the tradeoffs between these objectives. (See also W72-09065) (Bell-Cornell)
W72-09071

ECONOMICS OF HYDROLOGIC MODELLING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
C. C. Kisiel, and L. Duckstein.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 319-330, 21 ref. OWRR C-3259 (No. 3708) (1).

Descriptors: *Hydrologic systems, *Cost analysis, Mathematical models, Decision making, Systems

analysis, Water quality, Water quantity, Floods, Forecasting.
Identifiers: *Cost-effectiveness.

Much remains to be done in developing more efficient guidelines for choosing hydrologic models for different management goals. Serious evaluation is needed of the tradeoff between complete scientific understanding of a given environmental situation and managerial need to make decisions in the face of incomplete data, and constraints on budgets, time, technology and capable manpower to build models. Providing such evaluation possibilities is the cost-effectiveness technique outlined. In the face of multiple goals for model use and multiple criteria of judging model worth, this methodology puts forward a logical basis for choosing models, forcing consideration of the view that models have value only if they affect planning, design and operating decisions. The use of the technique is outlined in terms of models for forecasting of water quality and quantity (floods). (See also W72-09065) (Bell-Cornell)
W72-09072

A DECISION-SEQUENCE MODEL OF RESIDENTIAL OCCUPANCY OF URBAN FLOOD PLAINS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
L. D. James.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 331-340, 1 fig, 1 tab, 2 ref.

Descriptors: *Flood plains, *Planning, *Management, *Decision making, *Mathematical models, Operations research, Community development.
Identifiers: *Decision-sequence model, *Peachtree Creek Basin, Atlanta, Georgia, Flood plain settlement, Urban development.

The objective of modeling human response to flood hazard is to ultimately develop a suitable instrument for making those measurements needed to predict how people living in a particular flood plain will respond to alternative flood plain management programs. Reservoirs and channelization alleviate flood damage by reducing the frequency and severity of inundations. Flood plain management programs reduce damage by modifying human activity on the flood plain. A decision-sequence model is used to study how urban flood plain residents select a residential location, react to flood experiences, pressure for government help, and decide what they want done. Well-formulated efforts to mold existing processes to enhance community welfare must be made, and can succeed through a thorough understanding of the forces directing flood plain settlement. Empirical data are presented from interviews of 135 residents of a narrow Atlanta flood plain subject to frequent but shallow flooding. Findings show that the best informed people are attracted by site advantages to move voluntarily onto the flood plain; they move there expecting to be flooded and are not highly disturbed when damages inevitably occur. (See also W72-09065) (Bell-Cornell)
W72-09073

A NONLINEAR MATHEMATICAL PROGRAMMING MODEL FOR WATER QUALITY MANAGEMENT,
Calgary Univ. (Alberta).
M. B. Bayer.
In: Proceedings Vol. 2. International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 341-351, 5 tab, 19 ref.

Descriptors: *Water quality, *Waste water treatment, *Reservoirs, *Nonlinear programming, *Optimization, Oregon, Constraints, Dissolved oxygen, Biochemical oxygen demand.
Identifiers: *Storage dams, *Willamette River, Mainstream flows, Tributary flows.

Water storage for low flow augmentation is incorporated into a water quality model. Nonlinear programming is used to minimize construction costs for a set of structures for water quality management on a closed river basin system, subject to constraints on water quality. The scale of construction for wastewater treatment plants is measured by the costs of changing from an existing set of efficiencies to a new set of efficiencies. For storage dams and reservoirs, the scale of construction is measured by the costs of facilities required to maintain certain mainstream and tributary flows. The model, using DO constraints, is applied to data from the Willamete River in Oregon, and the results are compared with those obtained by others using linear and dynamic programming and first order BOD uptake reactions. The model, employing both DO and BOD constraints, examines benefits from augmenting mainstream flow. (See also W72-09065) (Bell-Cornell)
W72-09074

MINIMUM COST REGIONAL POLLUTION CONTROL SYSTEMS,
Michigan Univ., Ann Arbor. School of Public Health.
R. A. Deininger.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 352-361, 15 ref.

Descriptors: *Waste water treatment, *Water pollution control, Mathematical models, Systems analysis, Treatment facilities, Sewers, Optimization, Linear programming.
Identifiers: *Waste water transport.

With increasing public demand for a cleaner environment, the costs of water pollution control will be vastly increased. One method of lowering cost may be the joining of industries and municipalities in common treatment facilities to take advantage of the economies of scale in waste water treatment. An optimization (linear programming) model can be used to plan more economical new pollution control facilities and to upgrade existing systems. A given region is investigated as to where to build treatment plants and what interconnecting sewers are necessary to minimize the total regional cost of waste water treatment and transport. (See also W72-09065) (Bell-Cornell)
W72-09075

Ecole Nationale Superieure des Mines de Paris, Fontainebleau (France). Laboratoire d'-Hydrogeologie Mathematique.

In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 362-371, 3 fig, 12 ref.

Descriptors: *Groundwater, *Pollution, *Dispersion, *Mathematical models, Operations research, Tracers, Waste disposal, Mine wastes, Seawater, Solubility, Industrial wastes, Detergents, Viscosity, Density.
Identifiers: *Miscible pollutants, Hydrocarbons.

The theory of dispersion based on the general diffusion equation is an effective model of the displacement of miscible fluids in porous media. A dispersion scheme is used for quantitative treatment of miscible pollutants, and in some cases immiscible compounds behaving like tracers, found in groundwater. The theory is applied to field problems; derived and tested is a general methodology of in-situ studies of miscible pollutions based upon simple mathematical models and well defined field measurements. The model answers three basic requirements: reliability, simplicity, low cost. (See also W72-09065) (Bell-Cornell)
W72-09076

MODELLING WATER QUALITY FROM AGRICULTURAL LANDS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
G. V. Skogerboe, W. R. Walker, and J. E. Ayars.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 372-382, 1 fig, 14 ref.

Descriptors: *Irrigation effects, *Water quality, *Subsurface waters, *Irrigation water, Optimization, Agriculture, Model studies, Systems analysis, River basins, Reservoirs, Groundwater, River flow, Canal seepage, Evapotranspiration, Deep percolation, Flow.
Identifiers: *Prediction, *Water quantity.

Large-scale irrigation practices have been adversely affecting environmental water quality as evidenced by increases in nitrates, phosphates, salts, pesticides, sediments and the residues of many other agricultural products. This nation will have to optimize its use of agricultural materials to minimize its contributions of pollutants. Models must be developed which will predict the effects of agricultural materials and production on the quantity and quality of agricultural water being returned to groundwater reservoirs and river systems. The models must describe the quantity and quality of the subsurface return flow, and must be adaptable to large and numerous areas. (See also W72-09065) (Bell-Cornell)
W72-09077

WATER QUALITY MODELING FOR FORECASTIVE AND PLANNING PURPOSES,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
G. W. Reid.
In: Proceedings, Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 383-390, 2 tab, 4 ref.

Descriptors: *Water quality control, *Water pollution treatment, *Water conservation, *Planning, *Model studies, *Optimization, *Ecology, *Water quality management (Applied), Operating costs.
Identifiers: *Forecasting, *Stream response, *Receiving stream.

For too many years, man has been exploiting nature to suit his own technological needs. The resultant upset of the ecological system is being adversely felt by every form of existence which is dependent upon it. Through advance planning for intelligent, systematic use of our resources, our very way of life must become dedicated to avoiding further environmental degradation and ultimate destruction of the natural balance of ecology; we must understand fully how the natural environmental order functions. We must ask what goals or needs are required; what life style is desired; and what is the most suitable technology over time to provide for optimal development, appraised in terms of total costs including losses in the natural benefits. Water quality management is the key to reuse and water availability in the future for all needs; it requires effective treatment at the source in relation to the dilution or assimilative capacity of the receiving stream. Each of six categories of stream response is modeled employing a response/use matrix: biodegradable, nutritional, bacterial, solids, thermal, and persistent chemical. Four basic use categories are considered: domestic and municipal, direct industrial, agricultural, and recreational. (See also W72-09065) (Bell-Cornell)
W72-09078

ALTERNATIVE APPROACHES TO WATER RESOURCE SYSTEM SIMULATION,
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
L. R. Beard, A. O. Weiss, and T. A. Austin.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 391-400, 2 tab, 1 ref, 1 fig.

Descriptors: *Water resources development, *Management, *Planning, *Simulation, *Water storage, *Water transfer, *Water distribution (Applied), *Model studies, Linear programming, Systems analysis.

Identifiers: *Texas Water System, *Network analysis, *Sequential search procedures.

The development and operation of storage and transfer facilities will continue to be the most essential component of water management. The complexity of the planning process--the increasingly larger number of alternatives to be considered--requires that design and operation plans be examined in the degree of detail possible only with highly elaborate system simulation models. Two simulation techniques are demonstrated, a network analysis approach and a sequential search procedure. They are applied to a simplified version of the proposed Texas Water System, including a major port facility and two major canal systems containing nine reservoirs or groups of reservoirs and three other major delivery points. The relative efficiency of the two simulation models is discussed and demonstrated in relation to detailed simulation of the operation under stochastic variations of inputs and demands in a 17-year period. (See also W72-09065) (Bell-Cornell)
W72-09079

LIMITATIONS IN APPLYING MATHEMATICAL MODELLING TECHNIQUES TO REAL WATER RESOURCES PLANNING,
Tokyo Univ. (Japan). Dept. of Civil Engineering.
Y. Takahasi, and K. Takeuchi.
In: Proceedings, Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 401-409, 1 illus.

Descriptors: *Water resources, *Water management (Applied), *Planning, *Systems analysis, *Mathematical models, Social aspects, Environmental effects.
Identifiers: *Tone River Basin, *Tokyo, Japan.

In socially complex water resource systems, mathematical modelling techniques are hardly practicable for global optimization of systems except under drastic assumptions on relative weights among multiple objectives and on the shape of objective function. Limitations (social and natural environmental conditions) are rooted in many factors such as concept of optimality, incommensurable values, political and managerial feasibility, regional characteristics, as well as philosophy on values established through the historical process of social development. These factors are examined using as an example, the Tone River Basin, one of the most important and complicated water resource systems in Japan. Presented is a view on the necessary conditions under which mathematical modelling techniques can be utilized as practical aids for better decision making in real water resources planning. (See also W72-09065) (Bell-Cornell)
W72-09080

SYSTEMS ANALYSIS IN WATER RESOURCES PLANNING: SOME PERSPECTIVES,
Meta Systems, Inc., Cambridge, Mass.
R. J. deLucia, and J. J. Harrington.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 410-422, 1 fig, 9 ref.

Descriptors: *Water resources development, *Systems analysis, *Planning, *Decision making, Evaluation, Mathematical models.
Identifiers: Prescriptive models, Descriptive models.

The use and value of systems analysis in water resources planning are discussed. It is emphasized that the systems approach is not merely a set of mathematical techniques which can replace judgment and professional experience of managers and decision makers; it can, however, provide a rational basis for choosing a program of action among many alternatives. Physical, economic and institutional characteristics of water resources systems and their implications for the use of systems analysis in planning are examined. Deficiencies in systems studies that result from ignoring some of these considerations are discussed. The role of prescriptive and descriptive modeling techniques is presented and the use of nested model analysis discussed. Examples of large systems studies are reviewed and comments made on their successes and failures. (See also W72-09065) (Bell-Cornell)
W72-09081

DYNAMIC PROGRAMMING IN A HYDROELECTRIC SYSTEM,
Aluminum Co. of Canada Ltd., Arvida (Quebec).
R. J. Silver, M. H. Okun, and S. O. Russell.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 423-436, 4 fig, 1 tab, 1 ref.

Descriptors: *Hydroelectric plants, *Dynamic programming, *Model studies, *Planning, *Water resources, *Optimization, Systems analysis, Reservoirs, Canada, Computer programs, Simulation analysis.
Identifiers: *Powerhouses, *Prediction, *Saguenay River, Quebec.

Described is an application of dynamic programming to the problem of maximizing the firm power output from a complex hydroelectrical system during the reservoir drawdown period. The system is the Saguenay system of the Aluminum Company of Canada Ltd. (ALCAN), and it consists of three main reservoirs and six powerhouses with a total installed capacity of 2687 megawatts. The drawdown period extends from December 1 to April 15, and during this period natural flows are low and can be predicted with reasonable accuracy. This program is used for long-range planning (a more detailed simulation model is used for day to day operation). The ALCAN system, the concept of dynamic programming and how it was applied to this system are described. (See also W72-09065) (Bell-Cornell)
W72-09082

MULTIVARIATE RAINFALL GENERATOR FOR ANNUAL, SEASONAL, MONTHLY, AND DAILY EVENTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
J. C. Schaake, Jr., M. J. Ganslaw, J. W. Fothergill, and T. E. Harbaugh.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 437-460, 1 ref.

Descriptors: *Puerto Rico, *Simulation, *Stochastic processes, *Rainfall simulators, *Mathematical models.
Identifiers: *Matalas algorithm, Trend analysis.

A stochastic rainfall model was designed to simulate daily, weekly, monthly, seasonal, and annual rainfall events for any number of years at one or more sites, gaged or ungaged, anywhere on the Island of Puerto Rico. The concept and theoretical basis for the model are presented. The model uses the Matalas algorithm for generating annual rainfall depth. The annual depths are then disaggregated by a model that utilizes certain special properties of singular multivariate distributions. Data at ungaged sites are generated through the use of the trend analysis technique. The resulting computer simulation program is successfully implemented in FORTRAN, operates on a CDC 6600 and an IBM 370/155, is nearly self-contained and requires very few user inputs. (See also W72-09065) (Bell-Cornell)
W72-09083

A MODEL FOR A WATER QUALITY MANAGEMENT STUDY,
Systems Research Group, Inc., Toronto (Ontario).
A. C. Taylor, and R. W. Judy.
In: Proceedings Vol. 2, International Symposium on Modelling Techniques in Water Resources Systems, May 9-12, 1972. p 461-480, 6 fig, 11 ref.

Descriptors: *Water management (Applied), *Water quality control, *Waste water treatment, *Rivers, *River basins, *Optimization, *Mathematical models, *Operations research.

The problem addressed is the satisfaction of a set of specified water quality standards at given quality control points along a river within a prescribed planning period. A river basin agency must accomplish these standards in the most efficient way. In other words, the waste abatement measures employed must embody the least costly way, in terms of goods and services foregone, of achieving the quality standards. A three part mathematical model describes the effects of an efficient strategy. Implications are drawn from the model for the effectiveness of the rent allotment control as a water quality management strategy. Some of the difficulties in its implementation are discussed. (See also W72-09065) (Bell-Cornell)
W72-09084

WATER RESOURCES SYSTEMS ANALYSIS,
Meta Systems, Inc., Cambridge, Mass.
M. B. Fiering, J. J. Harrington, and R. J. deLucia.
Policy Research and Coordination Branch, Dept. of Energy, Mines, and Resources, Ottawa, Canada, Resource Paper No. 3, various paging, 1971. 16 fig, 11 tab, 14 ref.

Descriptors: *Canada, *Water management (Applied), *Water resources, *Planning, *Systems analysis, *Computer models, *Optimization, *Simulation analysis, *Dynamic programming, *Linear programming, *Model studies.
Identifiers: *Saint John River, *Synthetic flow generation.

The current capability to analyze problems of a higher complexity is new in the use of mathematical models for water resources systems planning and management. With this fresh capacity and rapid technological development, operations research techniques are swiftly finding widespread acceptance in many areas of managerial decision making. Aiming to extend the use and understanding of systems analysis techniques to a broader audience concerned with water resources planning and management, this monograph presents detailed discussions of two broad classes of computer models: Deterministic and Stochastic-Probabilistic. Deterministic type models (linear and dynamic programming) are used primarily to achieve optimization. Stochastic models are employed in simulation. To provide examples of the utility of such techniques, comprehensive mathematical models of the Canadian portion of the Saint John River System are presented. (Bell-Cornell)
W72-09085

6B. Evaluation Process

THE ARGUMENT FOR WATER-RESOURCE MANAGEMENT,
Orange County Water District, Santa Ana, Calif.
L. W. Owen.
Journal American Water Works Association, Vol 63, No 12, p 800-802, December 1971. 1 photo.

Descriptors: *Water resources development, *Planning, *Environment, Water quality control, Water supply, Desalination, Reclaimed water, Power system operation.
Identifiers: *Water resource management.

Water resource development is indispensible to modern man. One of the successes of water resource development has been flood control. One of the most promising solutions to increase water supply is that of desalination of seawater or reclaimed water. The demand for power could be a great stress upon the nations' water systems. The need for improved water quality is an important area of water resources development which should not be overlooked or minimized. Water development must include the enhancement of the en-

vironment as a major concern. Realistic solutions must be applied that accommodate all factions of water philosophy. Planning must occur in ever-widening parameters. (Strachan-Chicago)
W72-08530

ENVIRONMENT AND THE ENGINEER,
Butterheim Publishing Corp., Pittsfield, Mass.
W. S. Foster.
Journal American Water Works Association, Vol 63, No 9, p 561-563, September 1971. 1 photo.

Descriptors: *Environment, *Leadership, Engineering education, *Social participation, Communication, Planning, Economics.
Identifiers: *Public responsibility.

Engineers as public leaders is discussed. The engineer must demand a stronger part in solving present environmental problems. The engineer must learn to communicate more effectively. He must involve himself in public hearings, and grasp a problem totally, not simply the technical and economic aspects. Engineering examinations must consider public leadership. The engineering profession must emphasize the necessity of the engineer assuming public responsibility. If engineers fail to assume such leadership then the cause of the environment can only suffer. The opportunity and challenge of involvement and leadership in solving today's environmental problems are wide open to the engineer. (Strachan-Chicago)
W72-08531

THE WORLD'S WATER RESOURCES, PRESENT AND FUTURE,
G. P. Kalinin, and V. D. Bykov.
Impact of Science on Society, Vol 19, No 2, p 135-150, 1969. 5 tab, 2 fig, 8 ref.

Descriptors: *Water resources development, *Planning, *Decision making, Control, Environment, Hydrologic cycle, Water consumption, Runoff, Forecasting, Conservation, Water pollution control.
Identifiers: *Water resources considerations.

Certain conclusions are made through a discussion of the hydrologic cycle, the water content of the earth's rivers, the forecasting of water demand, the conservation of continental waters, the earth's heat, and pollution. The development of society involves increased consumption of water and increased return of used water into the hydrographic system. Reorganization of the hydrographic system and control of the hydrologic cycle will have great importance in the coming years. The environmental effects of various interventions in the water resource are known. Man must organize the environment at a higher level; (1) by developing supplementary artificial surface and underground hydrographic systems into which industrial and domestic effluents can be dumped, (2) by dumping waste directly into deep seas, or (3) by underground dumping of industrial waste, taking care not to contaminate usable groundwater. The problem today is to secure an optimum level of control of the run-off and of the exchange of matter for each physical and geographical zone. Water consumption requirements, changes induced in the physical and geographical environment by the retention of run-off, and changes induced in the hydrologic cycle are all prime considerations for the solution of water resource problems. (Strachan-Chicago)
W72-08534

ECONOMIC EVALUATION OF A SUBTROPICAL BAY FROM THE STANDPOINT OF WATER QUALITY MANAGEMENT,
Hawaii Univ., Honolulu. Dept. of Agricultural Economics.
H. Yamauchi.
In: Advances in Water Pollution Research, Proceedings of the 5th International Conference, 1970, San Francisco and Hawaii, p HA 12/1-12/7. 1 fig, 4 ref.

Descriptors: *Evaluation, *Hawaii, *Intangible benefits, *Estuarine environment, *Cost-benefit analysis, *Bait fishing, *Recreation, Water pollution, Decision making, Water quality control, Waste disposal, Hawaii.
Identifiers: *Socio-economic values, Estuarine pollution, *Kaneohe Bay (Hawaii).

Kaneohe Bay is used as a typical case of estuarine pollution in Hawaii. Cost-benefit analysis is applied to water quality management decision-making. To estimate socio-economic values, an attempt was made to monetarily quantify two of the more significant uses of the Bay (as a bait fishery and as a recreational resource). These dollar values were to be related to the physical baseline conditions of the Bay and then weighed against the costs of alternative methods of abating discharges into the area. Three approaches for evaluating the Bay as a bait fishery are discussed yet no satisfactory value of bait was established. However, an upper limit was set and some difficult issues were isolated. There are also problems in assigning dollar values to the recreational activity occurring in the area since such activities have, by nature, extra-market values. Alternative methods for controlling waste discharges into the Bay are elaborated and the least cost alternative was computed. Substantial cost savings can be realized by widening the range of physical and institutional alternatives from which to choose. (Haugh-Wisconsin)
W72-08595

PRIVATE RECREATION ENTERPRISE ECONOMICS,
Vermont Univ., Burlington. Agricultural Experiment Station.
For primary bibliographic entry see Field 06C.
W72-08596

PREDICTING QUANTITATIVE AND QUALITATIVE VALUES OF RECREATION PARTICIPATION,
Forest Service (USDA), Upper Darby, Pa. Pinchot Inst.
E. L. Shafer, Jr., and G. Moeller.
In: Recreation Symposium Proceedings, October 12-14, 1971, Syracuse, New York, State University of New York College of Forestry, p 5-22. 3 fig, 47 ref.

Descriptors: *Recreation demand, *Recreation facilities, Economics, *Forecasting, Regression analysis, Management, *Cost analysis.

Forecasting techniques for the quantitative and qualitative aspects of outdoor recreation participation are considered. This forecasting is done primarily (1) to recognize possible implications of long-term recreation commitments made today, and (2) to prepare now for related commitments that will have to be made rapidly, economically, and with minimum disruption sometime in the future. If future recreation consumption can be predicted, the problem of rapid decision-making can be reduced and the problems of implementing those decisions can be anticipated. The major problem in forecasting this demand is to define the important variables, and then to find the mathematical relationship between those variables and some measure of behavior, or attitude, or participation in a given recreation activity. The best approach to developing predictive recreation-use models may be to include distance, supply, and socio-economic variables in the same equation. The inference to draw from this equation would be that recreation use at the chosen site is related to distance from the site to the population centers, supply characteristics of the site, and user characteristics in the population centers surrounding the site. (Settle-Wisconsin)
W72-08597

BILLIONS TO SOOTHE THE TROUBLED WATERS,
For primary bibliographic entry see Field 05G.
W72-08598

THE SOCIAL AND ECONOMIC SIGNIFICANCE OF RECREATION ACTIVITIES IN THE MARINE ENVIRONMENT,
Wisconsin Univ., Green Bay. Leisure Sciences Collateral.
R. B. Ditton.
University of Wisconsin Sea Grant Program, Technical Report No. 11, January, 1972. 11 p, 1 tab, 27 ref.

Descriptors: *Recreation, *Water policy, Water users, Water resources development, Management, Planning.
Identifiers: *Coastal regions.

At the same time the nation is witnessing a recreation explosion, the effective supply of water resources needed to support its leisure activity is diminishing in both quantity and quality. This collision course will continue until more attention is paid to some constraints on future recreational use of water, namely water pollution, lack of legal access, and conflicting water uses. Displacement of recreational uses by other water uses can be attributed to (1) compliance with water quality criteria that have been tied to a narrow and parochial view of recreation, and (2) inability to adequately price the recreational value of specific marine regions. Consequently, there is a need to know what water quality characteristics are the most critical to specific water recreation user groups for their experiences to be satisfying. Until the total value of recreational use in coastal zones can be evaluated, recreation will fail to receive the same close attention as do other uses in public resource management decision-making. Without such a total value, government agencies find it difficult to divert any planning and development funds from other forms of recreation to the coastal zone. (Settle-Wisconsin)
W72-08599

THE FUTURE OF BOATING ON LAKE MICHIGAN.

Available from the National Technical Information Service as COM-71-01079, $3.00 in paper copy, $0.95 in microfiche. The University of Wisconsin Sea Grant Conference, 'The Great Lakes--Sink or Swim', October 15-16, 1970, Madison, Wisconsin, the University of Wisconsin Sea Grant Program, Public Information Report No. 6. August 1971. 24 p.

Descriptors: *Boating, *Recreation, *Lake Michigan, Recreation facilities, Harbors, Marinas, Water resources development, Wisconsin.

The papers and information developed during the 1970 meeting of the University of Wisconsin's annual Sea Grant Conference are briefly summarized. The topics include (1) the boating market and future boating facility needs on Lake Michigan; (2) the DNR, ORAP and future funding arrangements needed to promote marina development; (3) funding arrangements of the U.S. Army Corps of Engineers for harbor/marina developments; and (4) local marina development problems. Twelve other topics were considered at the conference; however, these discussions are not summarized. These topics included (1) the boating potential of Lake Superior; (2) boating use patterns and facility needs in urban areas; (3) user fees and recreation development; (4) the economics of boating facility allocation; (5) federal maintenance of recreational harbors; and (6) marina and harbor development in Michigan. The following areas for research were indicated by participants: (1) user origin and destination studies in Wisconsin; (2) studies to determine the feasibility of producing a continuous weather warning system; (3) the need to assess the relative importance of boater wastes; and (4) the need to develop new prototypes for boat launching facilities. (Settle-Wisconsin)
W72-08601

PROPOSAL OF THE WATER RESOURCES COUNCIL, INSTITUTING NEW CRITERIA FOR THE EVALUATION OF WATER RESOURCE PROGRAMS, CAUSES CONGRESSIONAL CONCERN--PROPOSED STANDARDS AND PROCEDURES FOR WATER RESOURCE PROJECTS,
Congress, Washington, D.C.; and Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-08652

UTILIZATION OF WATER RESOURCES IN THE NATIONAL ECONOMY (ISPOL'ZOVANIYE VODNYKH RESURSOV V NARODNOM KHOZYAYSTVE).

'Nauka', Moscow, 1970. 215 p.

Descriptors: *Water resources, *Water resources development, *Water utilization, *Planning, *Economics, Economic efficiency, Investment, Costs, Optimization, Probability, Water balance, Water sources, Water supply, Water delivery, Water reuse, Water allocation (Policy), Water management (Applied), Water conservation, Irrigation, Transportation.
Identifiers: *USSR.

This collection of 10 papers examines theoretical and practical problems in the economic planning and development of natural water resources in the USSR and the use of scientific methods to obtain the optimal design for a water-resources system from a number of alternative system designs. Specific problems in the conservation and rational use of water resources by individual branches of the national economy are discussed. (Josefson-USGS)
W72-08708

REGIONAL ECONOMIC DEVELOPMENT - THE ROLE OF WATER,
Utah State Univ. Foundation, Logan. Dept. of Economics.
W. C. Lewis, J. C. Andersen, H. H. Fullerton, and B. D. Gardner.
Available from the National Technical Information Service as PB-206 372, $9.00 in paper copy, $0.95 in microfiche. NWC-SBS-72-029, October 1971. 355 p. NWC-71-018.

Descriptors: *Alternative planning, *Area redevelopment, *Cost-benefit analysis, *Decision making, Evaluation, *Economic impact, Economies of scale, Employment opportunities, *Estimating, Federal project policy, Income, Indirect benefits, Induced benefits, Input-Output analysis, Investment, Methodology, Multiple purpose projects, Navigation, Project benefits, Project planning, Project purposes, Reclamation, *Regional analysis River basin development, Water policy, Water resources, Water resources development, Water supply.
Identifiers: Conceptual analysis, *Regional economic development, Regional economic impact.

The effectiveness of water resources development as a means of inducing economic development in sub-national regions is analyzed. The economic rationale for using public works to achieve economic growth, regional delineation issues, theoretical growth models, and growth measures are discussed. A state-of-the-art analysis of the effects of alternative water development programs on economic development in various types of regions is provided. Irrigation, navigation, hydropower, flood prevention, water supply, water quality, and recreation project are considered. Several estimating techniques are reviewed for possible use in assessing impacts from water investments. Included are: input-output, programming models, econometric models, and simulation. (NWC)
W72-08735

EARTH RESOURCES,
General Electric Co., Philadelphia, Pa. Missile and Space Div.
For primary bibliographic entry see Field 07C.
W72-08759

POWER IN THE YEAR 2001,
S. Walters.
Mechanical Engineering, Vol 93, No 9, Part I, p 24-26, Sept; No 10, Part II, p 21-25, Oct; No. 11, Part III, p 33-36, Nov; No. 12, Part IV, p 27-34, Dec 1971. 21 illus, 2 photo, 1 tab, 45 ref.

Descriptors: *Electric power production, *Energy conversion, *Solar radiation, *Sea water, *Thermal stratification, *Nuclear reactors, Thermal power, Fossil fuels, Bibliographies, Temperature, Ocean currents, Satellites (Artificial), Costs.
Identifiers: *Solar power generation, Solar cells, Solar collectors, Breeder reactors, Plasma physics.

Along with expanding technology, energy consumption and population growth have soared. Based on the present rate of use, fossil fuels will be practically exhausted in 200 yr. This 4-part article explores innovative energy systems, any one of which, if fully exploited, could meet our energy needs for thousands of years with minimal or no detriment to the environment. Generating power from temperature differences between tropical surface waters and colder currents flowing directly beneath may be possible as a result of advances in underwater technology. Project Sea Grant is an experiment in using this source for producing electric power. Solar energy gathered and focused earthward by satellites is another potential source of unlimited energy. Enormous quantities of low-grade uranium and thorium ores, dispersed throughout the earth's rocks. could be converted to fissionable fuel in breeder reactors. Sea burning, the process of extracting energy through fusion of the heavy isotopes of hydrogen, has not yet been proven scientifically feasible. (USBR)
W72-08771

A BILL TO ESTABLISH POLICY AND PRINCIPLES FOR PLANNING THE USE OF THE WATERND RELATED LAND RESOURCES OF THE UNITED STATES (NATIONAL WATER AND RELATED LAND RESOURCES POLICY ACT).
For primary bibliographic entry see Field 06E.
W72-08826

PROPOSED PRINCIPLES AND STANDARDS FOR PLANNING WATER AND LAND RESOURCES (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-08847

ENVIRONMENTAL QUALITY AND WATER DEVELOPMENT,
California Univ., Davis. Div. of Environmental Studies.
C. R. Goldman.
Available from the National Technical Information Service as PB-207 113, (Vol 1); PB-207 114 (Vol 2). $6.00 in paper copy, $0.95 in microfiche. National Water Commission, Washington, DC, Report NWC-EES-72-032, (1971), 2 vols, Vol 1: 597 p; Vol 2: 579 p. Contract NWC 70-033.

Descriptors: *Cost-benefit analysis, *Planning, *Water resources development, *Environmental effects, Decision-making, Economic justification, River basin development, Social values, Aesthetics, Evaluation, Attitudes, Psychological aspects, Recreation facilities, Estuaries, Conservation, Water policy, Multiple-purpose projects.

The purpose of the study is to assemble, within a two volume report, an evaluation of the causes of conflict between environmental quality and water-associated development in the United States. It surveys the history of water development and the evolution of American values and attitudes toward the environment. The environmental preservation movement is defined in terms of its demand for, interpretation of, and acceptance of water-related amenities. Basic principles are identified for more realistic environmental planning and decision making. Methods for balancing human values against cost-benefit analyses are suggested. Four case studies exemplify the kinds of compromises which have been struck between environmental quality and water development. In addition to a wide-ranging literature review, contributions from experts of widely divergent disciplines are used. Recommendations focus on improved evaluation and planning of water developments. (NWC)
W72-08874

THE RIVER NILE ECOLOGICAL SYSTEM: A STUDY TOWARDS AN INTERNATIONAL PROGRAMME,
Cairo Univ., Giza (Egypt). Dept. of Botany.
For primary bibliographic entry see Field 06G.
W72-08894

PLANNERS AS A 'PUBLIC' IN WATER RESOURCES PUBLIC PARTICIPATION PROGRAMS,
National Water Commission, Arlington, Va.
R. C. Tucker.
Water Resources Bulletin, Paper No. 72023, Vol 8, No 2, p 257-265, April 1972. 9 ref.

Descriptors: *Water resources development, *Planning, Local governments, Project benefits, Coordination, Multiple-purpose projects, Alternative planning, Project planning, Project purposes.
Identifiers: *Planners, *Public participation, Susquehanna River Basin Study, Planning levels, System complexity, Goals and objectives.

Benefits to be obtained in identifying urban and regional planners as a 'public' in public participation programs of water resources planning studies are discussed. A perspective on public participation is presented. Recent trends and developing concepts are identified: emphasis on the need to coordinate urban and regional planning activities with water resources planning, increasing system complexity, the goals and objectives orientation of planning, planning for multi-objectives, the evaluation of a broader range of alternatives, and the consideration of water alternatives as only one set of measures to further society's aspirations. One way to assist in capitalizing on these trends is to seek out participation of those in other planning efforts who are involved in planning but on a different level. Because of their intimate knowledge of an area's history, growth and development, politicial climate, local perceptions of needs and desires, and major problems and issues, they are able to contribute a great deal of insight in making the water resources planning effort more responsive at the local level. One of the first major efforts at working-level public-planner contact was carried out as part of the Susquehanna River Basin Study. A regional survey team comprised of an engineer and an economist from a federal agency and a state water resources planner met informally with planners, city managers, and local planning commissions to discuss issues related to water resources and the growth and development of local areas. This effort while only part of the overall public participation program yielded a number of benefits and if expanded and refined would be a very useful experience in other studies. (Strachan-Chicago)
W72-08953

GOALS IN WASTEWATER TREATMENT,
Wiley and Wilson, Lynchburg, Va.; and Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 05D.

W72-08958

PHILOSOPHY OF WATER SYSTEMS,
Detroit Metro Water Dept., Mich.
E. Cedroni.
Journal of the American Water Works Association, Vol. 64, No. 3, p 127-131, March 1972. 3 photo, 1 fig.

Descriptors: *Utilities, *Water management (Applied), *Planning, *Water demand instrumentation, Computers, Equipment, Financing, Personnel.
Identifiers: *Water systems, *Prediction, Public relations.

The water industry is a big business, and its success depends upon the ability of its management to compete with other businesses. The roles of intake, distribution system, personnel, commercial operations, engineering, and public relations in the management of a water system are discussed. Today, water utilities compete in the bond market for available finances, in the labor market for competent personnel, and in the news media for good will. With the present tools of instrumentation, computers, and equipment, management of water utilities has become a great challenge. Prediction of water demand requires careful planning. It must always be remembered that in the end, the utility deals with people. Satisfaction of the people being served cannot be achieved by a cold, calculating organization. (Strachan-Chicago)
W72-08959

NEW TRENDS IN WATER-RESOURCES DEVELOPMENT,
Wright-McLaughlin Engineers, Denver, Colo.
For primary bibliographic entry see Field 05G.
W72-08960

THE BALTIMORE REGION'S WATER-SUPPLY PLAN,
Hazen and Sawyer, New York.
R. H. Stewart.
Journal of the American Water Works Association, Vol. 63, No. 9, p 576-580, September 1971. 2 photo, 3 fig, 2 ref.

Descriptors: *Water supply, *Planning, *Regional development, Population, Water demand, Water requirements, Potomac River, Expansion.
Identifiers: *Baltimore (Md), *Regional Planning Council (RPC), Susquehanna.

A regional water plan was developed in 1969 for the Regional Planning Council (RPC) at Baltimore. The study area included Baltimore, three suburban counties (Ann Arundel, Baltimore, and Howard), and two exurban-rural counties (Carroll and Hartford). In the next 50 years, the population in the Baltimore area will more than double, and the average demand on the central water system will about triple. Four alternate water supply programs were presented. Two programs would provide the additional water requirements by expansion of the Susquehanna supply, and the other two would utilize Potomac water as well. Action to obtain reservoir sites is needed. (Strachan-Chicago)
W72-08961

THE CASE FOR THE ENVIRONMENT,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
I. L. Whitman, and N. Dee.
Journal of the American Water Works Association, Vol. 63, No. 9, p 792-794. September 1971.

Descriptors: *Environment, *Quality control, *Planning, *Water resources development, Evaluation, Long-term planning, Analysis, Economics.
Identifiers: *Environmental analysis, Commodity.

There is a case for the environment, which is becoming stronger and more compelling every day. The case for the environment may be presented and defended because it is now possible to utilize and refine a system for the evaluation of environmental impacts that is comparable in reliability to the present use of economic evaluation. Concern for the environment has demanded logical, sound, and practical systems of accounting for the environmental impacts of water resources projects. The importance of natural systems and the need to be concerned with the long-range, widespread geographic effect of large water resource projects are now recognized. There is a good economic argument for making a viable, logical case for the environment. Analysis of environmental impacts during the planning phases of water resources development provides a means for reducing potential environmental impacts. The US has realized that environmental quality is a desirable commodity for which some people are willing to pay. The case for good environmental analysis has been made into law by Public Law 91-190, the National Environment Policy. (Strachan-Chicago)
W72-08962

SITUATIONAL ANTECEDENTS TO LEISURE BEHAVIOR,
Illinois Univ., Champaign. Children's Research Center.
P. A. Witt, and D. W. Bishop.
Journal of Leisure Research, Vol. 2, No. 1, Winter 1970. p 64-77, 4 tab, 17 ref.

Descriptors: *Behavior, *Social aspects, *Theoretical analysis, Model studies, Psychological aspects, Recreation.
Identifiers: *Leisure behavior, *Situational antecedents, *Leisure theories, Leisure behavior inventory, Leisure.

Five 'need' theories of leisure behavior (surplus energy, relaxation, catharsis, compensation and task generalization) are outlined and their implications for a situation-response model of leisure behavior discussed. A Leisure Behavior Inventory (LBI) is described. It was constructed to ascertain whether the activities a person would like to participate in during one time period are affected by the experiences or situations he encounters in the prior time period. The LBI, consisting of 13 activities and 10 situations characteristic of the five leisure theories, was administered to eight groups of junior college students. Results showed some general confirmation for the concept that leisure behavior differs with the situational antecedents and that several of the theories of leisure are useful in explaining the relationships. The importance of this approach to the understanding of leisure behavior by park and recreation personnel is outlined with special emphasis given to the importance of understanding the causes as well as consequences of leisure behavior choices. (Davis-Chicago)
W72-08963

RECREATION BEHAVIOR PATTERNS AS RELATED TO SITE CHARACTERISTICS OF BEACHES,
Oklahoma State Univ., Stillwater. Dept. of Geography.
R. D. Hecock.
Journal of Leisure Research, Vol. 2, No. 4, Fall 1970. p 237-250, 3 fig, 6 tab, 15 ref.

Descriptors: *Recreation, *Behavior, *Recreation facilities, *Beaches, Tourism.
Identifiers: *Site characteristics, *Cape Cod, Socio-economic characteristics, Behavior patterns, Accessibility.

The analysis of sampled information about visitors to Cape Cod beaches reveals significant relationships between patterns of beach visitors and conditions existing at the various sites. Higher total attendance is associated with the availability of beach facilities and the development of nearby areas. Beach location relative to the Cape Cod Canal is important in explaining the patterns of day-users, but an entirely different criterion of accessibility is relevant to other visitors. Visitors' socio-economic characteristics and associated origin characteristics are related to the physical settings of beaches. Teenagers are particularly attracted to those beaches having food facilities and are the only identifiable group of users who seem to be influenced by crowding on the beaches. (Davis-Chicago)
W72-08964

THE EFFECT OF PUBLIC LAND ACQUISITION FOR OUTDOOR RECREATION ON THE REAL ESTATE TAX BASE,
Pennsylvania State Univ., University Park.
D. J. Epp.
Journal of Leisure Research, Vol. 3, No. 1, Winter 1971. p 17-27, 1 fig, 4 tab, 9 ref.

Descriptors: *Recreation, *Taxes, *Property values, *Public lands, Tax rates, Economics, Reservoir, Time series analysis, Land appraisals, Land use.
Identifiers: *Water-oriented outdoor recreation, Property tax, Recreational development, Public land acquisition.

Fifteen public land acquisitions for water-oriented outdoor recreation in Pennsylvania were examined to determine the effects on the property tax base. A time series of the tax base in jurisdictions where land was acquired by a public agency was compared with a similar series in comparable areas without such land acquisition. The study shows that local taxable land values seldom fell in absolute terms, and in those few cases where they did fall, all but one recovered within a very few years. It appears that public land acquisition of the magnitude of projects in this study does not restrict the revenue generating capacity of a real property tax. Analysis of the annual rate of increase in land values suggested the following hypothesis: At the time of public acquisition, or very shortly thereafter, the value of land near the recreation site increases rapidly, followed by a period where land values again increase at about the rate to be expected without recreational development. (Davis-Chicago)
W72-08965

WORK AND LEISURE: A SIMPLIFIED PARADIGM,
Oregon Univ., Eugene. Dept. of Sociology.
J. R. Kelly.
Journal of Leisure Research, Vol. 4, No. 1, Winter 1972. p 50-62, 3 fig, 32 ref.

Descriptors: *Recreation, *Theoretical analysis, Methodology, Social aspects, Psychological aspects.
Identifiers: *Leisure, *Work-relationship, *Discretion.

Definitions of leisure have been both exclusive and inclusive. Although different definitions have been used by various students of leisure, the nature of the differences has not always been clear. Dualistic and monistic approaches to understanding life account for exclusive-inclusive differences. However, the two dimensions that appear most important to common definitions are those of work-relationship and discretion. A paradigm is developed using these dimensions to construct a four-celled scheme. Nonwork activity may be (1) For-its-own-sake: not determined by the work relation and freely chosen; (2) Coordinated: dependent on the work relation in content but freely chosen; (3) Complementary: independent of work in content and form but determined by social roles or the need to compensate for work; and (4) Recuperation or preparation: required by the work relation and necessary rather than chosen. In four types of definitions leisure and nonwork are distinguished by which of these four cells is included in each. The paradigm is suggested as an inclusive theoretical simplification. (Davis-Chicago)

W72-08966

METHODOLOGICAL PERSPECTIVES FOR THE STUDY OF OUTDOOR RECREATION,
Kentucky Univ., Lexington. Dept. of Sociology.
R. J. Burdge, and D. R. Field.
Journal of Leisure Research, Vol. 4, No. 1, Winter 1972. p 63-72, 35 ref.

Descriptors: *Recreation, *Methodology, Social aspects, Psychological aspects, Planning.
Identifiers: *Outdoor recreation, Social aggregate level, Social organization, Social ecology.

Methodological perspectives for the study of outdoor recreation are classified according to (1) the social aggregate level, (2) the social-psychological level, (3) the types of social organization, (4) activity attributes, (5) the community level, and (6) the social ecological approach. General research topics useful to social scientists are suggested for each of these perspectives. Because outdoor recreation is a practical rather than a theoretical problem it is suggested that studies should consider a variety of methodological approaches. (Davis-Chicago)
W72-08967

SOCIOECONOMIC PATTERNS OF OUTDOOR RECREATION USE NEAR URBAN AREAS,
Vermont Univ., Burlington. Agricultural Experiment Station; and Inter-American Inst. of Agricultural Sciences, Turrialba (Costa Rica).
J. J. Lindsay, and R. A. Ogle.
Journal of Leisure Research, Vol. 4, No. 1, Winter 1972. p 19-24, 1 tab, 9 ref.

Descriptors: *Recreation, *Recreation demand, *Social aspects, *Cities, Social needs, Social participation, Social impact, Education.
Identifiers: *Outdoor recreation, *Recreation resources availability, *Socioeconomic aspects, Opportunity theory.

The urban population of Weber County, Utah, was sampled to determine its outdoor recreation use of an adjacent National Forest Recreation Area and to relate this use to socioeconomic characteristics. Contrary to many previous studies, results showed income did not vary between users and nonusers and in general, users had less, not more, education than nonusers. The absence of income variation may be explained by the opportunity theory of outdoor recreation demand. It may be that national differentials in participation associated with income and education are due to the lack of available opportunities for individuals in low income and education categories. (Davis-Chicago)
W72-08968

THE ROLE OF PERCEPTION IN THE RECREATION EXPERIENCE: A REVIEW AND DISCUSSION,
Monash Univ., Clayton (Australia).
D. Mercer.
Journal of Leisure Research, Vol. 3, No. 4, Fall 1971. p 261-276, 117 ref.

Descriptors: *Recreation, *Social aspects, *Behavior, Planning, Model studies, Attitudes, Social values, Decision making, Measurement, Methodology.
Identifiers: *Perception, Human satisfaction.

Human satisfaction is becoming increasingly common as a goal of planning in many different contexts. Terms such as perception and activity, time or place preference appear consistently in the literature on outdoor recreation; and yet only rarely is the precise meaning of such terms spelled out. Clawson's five-stage model of the recreation experience is used as a framework for a review and discussion of a number of selected studies from various social science disciplines which have focused on the attitudes and behavior of the individual recreationist or small group. Emphasis is placed on work that is of relevance in the study of spatial behavior. In particular, attention is focused on the various goals inherent in recreation behavior, the 'images' presented by outdoor recreation sites, the logic used by the recreationist in choosing a site, and the factors influencing the distance traveled for recreation. Some of the measurement problems are noted, and the need for a much stronger research emphasis on the individual recreationist's decision-making process is urged. (Davis-Chicago)
W72-08969

THE RECREATIONAL BUSINESS DISTRICT,
Glassboro State Coll., N.J.; and Kent State Univ., Ohio.
C. A. Stansfield, and J. E. Rickert.
Journal of Leisure Research, Vol. 2, No. 4, Fall 1970. p 213-225, 3 fig, 2 tab, 14 ref.

Descriptors: *Recreation, *Cities, *Community development, *Tourism, Urbanization, City planning.
Identifiers: *Recreational business district, Urban business districts.

A classic, predictable series of urban business districts is recognized by most urban specialists. Most sizeable towns possess a Central Business District, a number of Shopping Thoroughfares, Neighborhood Business Districts and Isolated Retail Nodes. Each of characteristic districts may be identified by a characteristic set of retail establishments. To this usual series of business districts must be added a 'Recreational Business District' (RBD). This RBD, as found in resorts, is characterized by a distinctive array of pedestrian, tourist-oriented retail facilities and is separated spatially as well as functionally from the other business districts. The retail districts of two small New Jersey seashore resorts, as well as Niagara Falls, Canada, are examined in terms of their retail establishments. The RBD stands apart from the common set of retail business districts in that it is based on a recreational attraction rather than upon proximity to residential areas or transportation routes. The hinterland of the RBD extends far beyond the border of the year-round trade area of the town since it depends largely upon tourist trade. (Davis-Chicago)
W72-08970

A SYSTEMS STUDY OF FUTURE GROUNDWATER DEVELOPMENT COSTS IN THE CHICAGO REGION,
Illinois State Water Survey, Urbana.
A. F. Moench, R. J. Schicht, and A. P. Visocky.
Water Resources Bulletin, Paper No. 72030, Vol. 8, No. 2, p 328-337, April 1972. 3 fig, 4 tab, 5 ref.

Descriptors: *Systems analysis, *Groundwater resources, *Costs, Estimating, Alternative planning, Water supply, Water quality, Aquifers.
Identifiers: *Chicago, Illinois region, Groundwater demands.

The cost of developing groundwater resources in northeastern Illinois from 1980-2020 is estimated for the purpose of providing a basis for comparing alternative sources. Demands for each township in the study area are estimated at 10-year increments and are satisfied, where the supply is sufficient, in such a way as to minimize the cost subject to constraints on supply. Sources of water are two shallow aquifers with known potential yields and a series of deep aquifers treated as a single unit and modeled on a digital computer. For each township the costs of wells, pumps, power and rehabilitation is estimated for each aquifer on a per million gallons of water per day basis. In addition the cost of groundwater treatment necessary to raise the quality to that of treated Lake Michigan water is considered. Raw water costs are found to vary from 2 to 14 cents per 1000 gallons depending upon the depth to the deep aquifer water. Treated water costs vary from 22 to 53 cents per 1000 gallons, the lower costs applying to the largest users because of the economy of scale. With proper distribution of pumpage there is sufficient water in storage in the deep aquifers to meet groundwater demands through 2020. (Strachan-Chicago)
W72-08972

LET'S REVITALIZE WATER PLANNING,
Izaak Walton League of America, Environmental Affairs.
T. Pankowski.
Water Spectrum, Vol. 4, No. 1, p 23-29, Spring 1972. 5 photo.

Descriptors: *Planning, *Projections, *Environment, *Economics, *Water resources development, Pollution abatement, Ecology, Financing.
Identifiers: *Water planning, *Revitalization, *Integration, *Public participation.

A new basis is needed for water planning. Present efforts are based on economic and population trends projected into the future. The typical Office of Business Economic Research Standards (OBERS) projection consists of viewing the past conditions within a given geographic area; adding a series of modifiers such as average birth rates and indices of inflation; multiplying and/or dividing. Water resource planners consider these projections to be synonymous with public goals, and as a result, planning decisions are reduced to when, where and how a project can be built to meet these needs. Such issues as pollution abatement and control, wild and scenic river designations, the preservation of ecological and historic sites, open spaces and housing, flood plain and estuarine protection, and agricultural locations and their amenities are not considered. Environmentalists view the OBERS system as a series of self-fulfilling prophecies. Land and water planning must be integrated and based on the carrying capacity of the region to satisfy certain economic and environmental needs. Planning then becomes a positive force for desirable change rather than a reaction to uncontrolled growth. Such planning techniques have been suggested by the Lands Committee of the Pacific Northwest River Basin Commission in their report, Ecology and the Economy. Furthermore, funds should be made available to public interest groups to ensure their participation in the planning process. This article is written in response to 'Nourishing Public Participation', by Harry Cook in the Fall 1971 issue of Water Spectrum. (Strachan-Chicago)
W72-08974

ARE RIVER BASINS THE BEST FRAMEWORK FOR WATER RESOURCES PLANNING, DEVELOPMENT, AND MANAGEMENT,
Office of Water Resources Research, Washington, D.C.
L. R. Brown.
Water Resources Bulletin, Vol. 8, No. 2, p 401-403, April 1972.

Descriptors: *River basins, *Water resources development, *Planning, Multiple purpose, *Regional analysis.
Identifiers: *National framework, Externalities, *Regional planning.

The use of river basins as a framework for the planning, development, and management of water resources is discussed in terms of: water supply, urban water supply, water quality, hydroelectric power, irrigation water, water-based recreation, and economic development. On the whole, river basins provide a somewhat questionable framework for working with water resources. They provide an effective and logical structure for water quality and flood control, but seem inadequate in dealing with water supply, power, navigation, irrigation, recreation, and economic development. A national framework to interrelate and mediate among individual basin plans would improve the system. Furthermore, the use of a substructure of city regions might also improve the basin approach, along with increased attention to

externalities. Basically, suggestions and recommendations from the readers are sought. (Strachan-Chicago)
W72-08975

POPULATION CONTROL: NOT A NECESSITY IN WATER RESOURCE MANAGEMENT,
Office of the Chief of Engineers (Army), Washington, D. C. Civil Works Directorate.
R. R. Werner.
Water Spectrum, Vol. 4, No. 1, p 37-42, Spring 1972. 1 photo, 16 ref.

Descriptors: *Population, *Water supply, Economics, Pricing, *Water demand, *Planning.
Identifiers: *Water resources management, *Policy making, *Population control.

A response is made to an article by William M. Chamberlin, entitled 'Population Control: Ultimate Necessity in Water Resources Management', published in the previous issue of Water Spectrum. The subject under discussion is how sharply the population growth problem impinges on the resource problem, specifically water resources management. While Chamberlin claimed that within a few years the United States will have fully utilized its fresh water supplies, Werner denies this. There is plenty of land and water. It is the lack of adequate economic price placed on these resources in the past which has caused much of the problem of water supply. Water demand should be considered in terms of economics. Although there is some belief that water resource development policy should have as its explicit objective the controlling of population increases in the nation, resource agencies tend to keep away from this proposal. Planning which does not consider the needs of a population causes precipitate acts which result in far more damage than well planned development. Limiting population through limiting water supply is a harsh solution, nor does it assure success. Other means to effect a population philosophy or policy may be more effective. It is not too early or too difficult to introduce the economics that will place more realistic prices on water, energy, and the natural environment itself. (Strachan-Chicago)
W72-08978

WALT DISNEY WORLD AND THE ENVIRONMENT: AN ECOLOGICAL CHALLENGE IN CENTRAL FLORIDA,
Walt Disney World, Orlando, Fla.
F. W. Harden.
Water Spectrum, Vol. 4, No. 1, p 30-35, Spring 1972. 7 photo.

Descriptors: *Florida, *Environmental effects, *Ecology, *Conservation, Planning, Wildlife conservation, Education.
Identifiers: *Walt Disney World, Conservation area, Public observation.

The conservation measures taken by the Walt Disney World in constructing its new facilities in central Florida are discussed. The Disney management has made a total commitment to maximum protection of the environment. An evaluation team recommended the use of utilidores, a living tree farm, a modern waste water treatment plant, trash incineration, automated trash collection, measures for protection of water quality, a central energy plant, control of pesticide use, and pollution prevention. More than 7,500 acres of land has been designated for permanent protection as a Conservation Area. The objectives in establishing the Conservation Area were: (1) to demonstrate that urbanized development can be achieved without causing deterioration of the environment; (2) to protect areas of natural beauty; (3) to provide a wilderness sanctuary for animals and plants native to the area; (4) to develop a program which would permit the public to observe the subtropical aquatic environment and wildlife indigenous to the area; and (5) to allow further opportunities for Walt Disney Productions to inform and educate the public on conservation, nature, and wildlife activities. (Strachan-Chicago)
W72-08979

THE POLLUTION PROBLEM AND LEGAL INSTITUTIONS: A CONCEPTUAL OVERVIEW,
California Univ., Los Angeles. School of Law.
For primary bibliographic entry see Field 05G.
W72-09031

MODELLING DECISION EFFECTIVENESS APPLICATION TO WATER RESOURCE SYSTEMS,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 06A.
W72-09069

ESTIMATING THE POLITICAL FEASIBILITY OF ALTERNATIVE WATER-RESOURCE PLANS,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 06A.
W72-09071

ECONOMICS OF HYDROLOGIC MODELLING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 06A.
W72-09072

A DECISION-SEQUENCE MODEL OF RESIDENTIAL OCCUPANCY OF URBAN FLOOD PLAINS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 06A.
W72-09073

WATER QUALITY MODELING FOR FORECASTIVE AND PLANNING PURPOSES,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 06A.
W72-09078

ALTERNATIVE APPROACHES TO WATER RESOURCE SYSTEM SIMULATION,
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
For primary bibliographic entry see Field 06A.
W72-09079

LIMITATIONS IN APPLYING MATHEMATICAL MODELLING TECHNIQUES TO REAL WATER RESOURCES PLANNING,
Tokyo Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-09080

SYSTEMS ANALYSIS IN WATER RESOURCES PLANNING: SOME PERSPECTIVES,
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06A.
W72-09081

DYNAMIC PROGRAMMING IN A HYDROELECTRIC SYSTEM,
Aluminum Co. of Canada Ltd., Arvida (Quebec).
For primary bibliographic entry see Field 06A.
W72-09082

A MODEL FOR A WATER QUALITY MANAGEMENT STUDY,
Systems Research Group, Inc., Toronto (Ontario).
For primary bibliographic entry see Field 06A.
W72-09084

WATER RESOURCES SYSTEMS ANALYSIS,
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06A.
W72-09085

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

FINANCIAL CONTROL VIA METER MANAGING,
Corpus Christi, Tex.
A. M. Cunningham.
Journal American Water Works Association, Vol 64, No , p 3-5, January 1972. 5 tab.

Descriptors: *Economics, *Costs, *Utilities, *Instrumentation, *Water demand, Pipes, Planning, Decision making.
Identifiers: *Financial control, *Meter managing.

The utility has the primary responsibility of maintaining the lowest cost and adequate service to the customer. To accomplish this objective, the control of the meter and service construction design must remain with the management. To economically and adequately service the customer, the management must make three considerations. It must consider the customer's demand, the proper size of the service and meter, and the proper house pipe size. How to determine the customer demand, how to select the meter, and how to size the service are discussed. (Strachan-Chicago)
W72-08533

THE PRODUCTION OF THREADFIN SHAD AS LIVE BAIT FOR HAWAII'S SKIPJACK TUNA FISHERY: AN ECONOMIC FEASIBILITY STUDY,
Hawaii Univ., Honolulu. Economic Research Center.
Y. C. Shang, and R. T. B. Iversen.
Available from the National Technical Information Service as COM-71-00996, $3.00 in paper copy, $0.95 in microfiche. July, 1971. 42 p, 3 fig, 14 tab, 6 ref, append.

Descriptors: *Commercial fishing, *Baits, *Productivity, Economic feasibility, Fish hatcheries, Bait fishing, *Hawaii.
Identifiers: *Skipjack tuna, *Shad.

The fishery for skipjack tuna is the most important commercial fishery in Hawaii, producing about 5,000 tons per year. At present, a small anchovy called nehu is the major species of live bait used to catch the tuna; it constitutes about 92% of all baitfish utilized. Estimates indicate that Hawaii's fishermen are paying about $14 per bucket for bait during the peak fishing months and about $11 during the other fishing months. If threadfin shad were available, it would be worth about $15-$16 per bucket during the peak fishing period and about $12-$13 during the other fishing months. Its greater value arises due to its lower mortality rate at sea. These estimates suggest that commercial shad hatcheries would be feasible with an annual production of 3,660 buckets of shad per 10-acre pond unit. These conclusions are invariant with respect to the discount rate used, provided the rate is in the 6-14% range. Furthermore, the source of fresh water for the shad hatchery makes no significant difference in profitability of the operation. It can be supplied from a well or purchased. Large-scale operations appear to be the most profitable. (Settle-Wisconsin)
W72-08593

PRIVATE RECREATION ENTERPRISE ECONOMICS,
Vermont Univ., Burlington. Agricultural Experiment Station.
M. I. Bevins.
In: Recreation Symposium Proceedings, October 12-14, 1971, Syracuse, New York, State University of New York College of Forestry, p 33-39. 12 ref.

Descriptors: *Recreation demand, *Recreation facilities, *Profit, Economics, Economies of scale, Taxes, Prices, Seasonal, *Cost analysis.

Recent studies have indicated that there is a relatively limited opportunity for financial success in the outdoor recreation business. In general, returns to labor and management have been extremely low for firms engaged in providing outdoor recreation. Several factors are associated with income levels in this occupation. Among the more important are location of enterprise, scale of operation, business volume, length of season, and price level. Income levels tend to be very low because (1) locational factors are not given sufficient consideration; (2) the enterprises tend to be too small for profitable operations; (3) most firms have too few customers; (4) the relatively short season restricts profitability; and (5) public recreational services impose serious restrictions on the private sector's ability to price according to actual cost of operation. However, low returns may not discourage entry into this field. In many instances the decision to enter is more related to personal and noneconomic considerations than to profit maximization. Low returns coupled with rising property taxes may, however, have the ultimate effect of overbalancing these personal and noneconomic factors, thus ending recreation business activities. (Settle-Wisconsin)
W72-08596

TAX INCENTIVES DON'T STOP POLLUTION,
A. W. Reitze, and G. Reitze.
American Bar Association Journal, Vol. 57, p. 127-131, February 1971. 29 ref.

Descriptors: *Taxes, *Capital costs, *Depreciation, *Equipment, Water pollution control, Pollution abatement, Water treatment, Water pollution sources, Industrial wastes, Industrial water, Air pollution, Legal aspects, Administrative agencies, Social aspects, Political aspects, Economics, Income, Profit.
Identifiers: Depreciation deductions, Tax incentives, Pollution abatement equipment.

Tax incentives are ineffective in stopping industrial pollution because they only offer a subsidy for doing something which is not profitable. Incentives do not control pollution. The major feature of all incentives is a rapid depreciation write-off for capital expenditures made to reduce pollution. This is often abused because it is used for equipment which cleans water coming into the plants, not discharged water. Incentives cause a revenue loss and should only be used for benefits which would be gained without the incentive. Varying estimates of the cost of the incentive features are discussed. The basic reasons why incentives fail to control pollution are: (1) they do not stimulate investment in profitable facilities since pollution control equipment is not profitable, (2) they aim only at control equipment and not at improving industrial processes which might more effectively reduce pollution, (3) they do not aim at operating costs which might be substantial, (4) they only benefit large companies with excess income needing tax shelter, and (5) they shift the burden of the program to the general public through a redistribution of the tax burden. (Grant-Florida)
W72-08661

THE EFFECT OF PUBLIC LAND ACQUISITION FOR OUTDOOR RECREATION ON THE REAL ESTATE TAX BASE,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 06B.
W72-08965

USE OF A PRICING MODEL FOR EFFICIENT WATER SUPPLY ALLOCATION,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 06A.
W72-09068

6D. Water Demand

WATER RESOURCES OF DORCHESTER AND TALBOT COUNTIES, MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 04B.
W72-08500

FINANCIAL CONTROL VIA METER MANAGING,
Corpus Christi, Tex.
For primary bibliographic entry see Field 06C.
W72-08533

THE WORLD'S WATER RESOURCES, PRESENT AND FUTURE,
For primary bibliographic entry see Field 06B.
W72-08534

THE SOCIAL AND ECONOMIC SIGNIFICANCE OF RECREATION ACTIVITIES IN THE MARINE ENVIRONMENT,
Wisconsin Univ., Green Bay. Leisure Sciences Collateral.
For primary bibliographic entry see Field 06B.
W72-08599

THE STORY OF THE WATER SUPPLY FOR THE COMSTOCK,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 06E.
W72-08760

THE RELATIONSHIP BETWEEN HOUSING AND WATER RESOURCES PLANNING AND MANAGEMENT,
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W72-08952

THE BALTIMORE REGION'S WATER-SUPPLY PLAN,
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 06B.
W72-08961

USE OF A PRICING MODEL FOR EFFICIENT WATER SUPPLY ALLOCATION,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 06A.
W72-09068

6E. Water Law and Institutions

LEGAL ASPECTS OF THE UTILIZATION OF ARTIFICIAL SATELLITES FOR METEOROLOGICAL AND RADIO COMMUNICATION PURPOSES,
Akademiya Nauk SSSR, Moscow. Inst. of State and Law.
G. P. Zhukov, E. G. Vasilevskaya, and P. I. Lukin.
Available from NTIS, Springfield, Va. 22151 TT F-669 $3.00 paper copy; NASA Technical Translation TT F-669, March 1972. 156 p, (Translation of 'Pravovyye aspektv ispol'zovaniva iskusstvennykh sputnikov dlva tselev meteorologii i radiosvyazi,' 'Nauka' Press, Moscow, 1970.)

Descriptors: *Meteorology, *Weather forecasting, *Satellites (Artificial), *Legal aspects, *International law, Radio communication systems, Legal review, Administration, Storms, Hurricanes, Precipitation (Atmospheric).
Identifiers: Cosmos.

Some of the basic international legal problems arising in the present and future use of meteorological and communications satellites are surveyed. Among the topics discussed are existing and proposed international legislation on the use of space for peaceful purposes, international legal control (administration) of national ground and space operations, liability for damage in space or resulting from space operations, and the legal status of private, international and intergovernmental organizations and their personnel. Much of the report is devoted to the 1967 Treaty on Space and the 1968 Agreement on the Recovery of Cosmonauts, along with various resolutions and other legislative items of the United Nations General Assembly. The launch of the first meteorological satellite, 'Explorer VII' (USA), was on October 13, 1959. The Soviet program of launching the 'Cosmos' series of artificial satellites was announced on March 16, 1962. (Woodard-USGS)
W72-08489

INSTITUTIONAL ARRANGEMENTS FOR INTERNATIONAL ENVIRONMENTAL COOPERATION.
National Academy of Sciences, Washington, D.C. Environ Mental Studies Board.

A Report to the Department of State by the Committee for International Environmental Programs, Environmental Studies Board, National Academy of Sciences/National Academy of Engineering, 1972. 74 p.

Descriptors: *Institutions, *Planning, *Decision making, *Environmental control, *Protection, Monitoring, Organizations, Cooperation.
Identifiers: *International environmental cooperation, *Global monitoring, *Enhancement, World environment fund.

Some of the principal elements of an evolving system of decision making and control for the protection and enhancement of the human environment are discussed. The importance of science in decision making at the international level is emphasized. Discussions include: (1) the global environment and the national interest, (2) basic institutional choices, (3) structural and procedural changes in the United Nation (UN) system, (4) an environmental science advisory and research board, (5) a monitoring and surveillance network, (6) a world environment fund, (7) strengthening transnational environmental capabilities, and (8) related issues and unresolved problems. It is recommended that the US Government support: (1) the establishment of a unit in the UN to provide central leadership; (2) the creation of an independent global environment science advisory board; (3) proposals which suggest the development of a global monitoring system within the UN; (4) the establishment of a world fund for the human environment, and (5) current initiatives by transnational or regional organizations to deal with environmental problems as an integral part of ongoing programs. (Strachan-Chicago)
W72-08540

INTERNATIONAL ASPECTS OF MAN'S EFFECT UPON ENVIRONMENT,
National Academy of Sciences, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-08600

POLICY MAKING IN THE FIGHT AGAINST WATER POLLUTION, (IN FRENCH),
Secretariat Perma. Etude Probl. Fau, Paris (France).
For primary bibliographic entry see Field 05G.
W72-08625

THE SEABED ARMS LIMITATION TREATY: A SIGNIFICANT DEVELOPMENT IN ARMS CONTROL AND DISARMAMENT,
S. M. Selzer.
Journal of International Law and Economics, Vol. 6, p 157-174, 1971. 77 ref.

Descriptors: *Beds under water, *Continental shelf, *Nuclear explosions, *Treaties, *International law, United Nations, International waters, Law of the sea, Jurisdiction, Legal aspects, Beds, Governmental interrelations, History, Oceans, Administration, Radioactivity, Nuclear energy, Political aspects.
Identifiers: *Weapons, *Nuclear weapons, *Treaty on Prohibiting Emplacement of Nuclear Weapons on Seabed and Ocean Floor.

The Treaty is a logical and vital step toward the essential goal of a peaceful world through disarmament and arms control. Preventing an arms race on the seabed is desirable because of the substantial dangers inherent in the presence of nuclear weapons hidden over such a large area of the earth. The Treaty squarely faces the need for ocean and seabed arms control while recognizing the existence of national sovereignty. The history of twentieth century disarmament conferences is presented. The Treaty forbids any state from implanting any nuclear or other weapons of mass destruction on the seabed beyond twelve miles from its coast. Article II makes clear the Treaty excludes law of the sea issues. Article IV, a disclaimer provision, supports the exclusionary limit. A verification system based on free observation utilizes consultation to resolve any questions raised by observation. Article V through IX are concerned with procedural matters. (Ilkson-Florida)
W72-08641

ENVIRONMENT REPORT/WHITE HOUSE SEEKS TO RESTRICT SCOPE OF ENVIRONMENTAL LAW,
C. E. Barfield, and R. Corrigan.
National Journal, Vol. 4, p 336-349, 1972. 1 illus, 11 photo.

Descriptors: *Environmental sanitation, *Legislation, *Water quality control, *Environmental effects, *Political aspects, Legal review, Judicial decisions, Legal aspects, Federal government, Rivers and Harbors Act, Water Quality Act, Permits, Regulation, Adoption of practices, Administrative agencies, Navigable waters, Political constraints, Institutional constraints.
Identifiers: *National Environmental Policy Act, *Environmental impact statements.

Section 102 of the National Environmental Policy Act (NEPA) and various interpretations placed on it by courts, administrators, and legislators are examined. The section requires that every federal agency include in its recommendations for legislation or other major actions a statement on environmental impacts. Several federal district court cases, which have construed this to apply to actions by existing mission-oriented agencies, are discussed. Such cases have expanded the scope of NEPA. Various bills and amendments which would further expand NEPA are considered. The Nixon Administration's attempts to limit the scope of section 102 are discussed. One problem with NEPA has been its relationship to the water quality control program and Refuse Act permits: the problem is whether section 102 overrides or complements the permit system. The Baker amendment to the Muskie Bill, which limits the effect of section 102, is discussed. Decisions of the Environmental Protection Agency relating to section 102 are considered. Industry reaction, especially the electric power industry, and the work of public interest law firms are examined. (Grant-Florida)
W72-08642

CARVING UP THE SEAS: PROBLEMS OF OCEAN OWNERSHIP,
W. L. Hoskins.
Federal Reserve Bank of Philadelphia Business Review, November 1971, p 10-18, 3 dwg.

Descriptors: *International law, *Oceans, *Water resources, *Exploitation, *Law of the sea, Continental shelf, Resources, Natural resources, Conservation, Mining, Commercial fishing, Exploration, Beds under water, Non-structural alternatives.

Roughly five-sevenths of the earth's surface is ocean. Abundant resources are found in the ocean bottom and beneath the floor of the sea. Recent technology has put these resources within reach of man. It has also led to conflicts between nations. Most of the sea is commonly owned by all nations. This means each nation has the right to navigate and use the sea's resources as it sees fit. Common ownership, however, is harmful. Instead of national resource management, each nation attempts to deplete a resource area: to leave it would mean harvest for someone else. Moreover, under common ownership the ocean becomes a common garbage dump and pollution threatens ocean life. One possible solution may be 'corporate ownership'. Both poor and rich nations would be given stock through an international agency. Countries desirous of developing a resource would bid for the rights, with the agency accepting the highest bid. Bid revenues would be dispensed as yearly dividends, with any profits going to the developer. The efficient utilization of ocean resources would be enhanced by international management. (Nielsen-Florida)
W72-08643

CHANGING TIMES: UNIFORM RULES URGED AS POLLUTION BECOMES A WORLD-WIDE PROBLEM,
R. Vicker.
Wall Street Journal, November 29, 1971, at 1, 16, Col. 1. 2 p.

Descriptors: *Water pollution control, *Pollution abatement, *Industrial wastes, *Integrated control measures, *Governmental interrelations, International law, Legal aspects, Water pollution, Pollution, Oceans, Foreign countries, United Nations, Political constraints, Industrial production.

Pollution is an international problem. Because so much of it is caused by industry, it is rapidly becoming an international business problem. As concern for the environment becomes a popular issue in more and more countries, those countries crack down on polluters. Business, faced with such a prospect, is urging uniform rules for pollution control. Businessmen fear that a lack of coordination among national regulations could lead to a sort of 'flags of convenience' situation in which certain countries would offer lax pollution controls to lure industry. The result could be a severe competitive disadvantage for companies operating in stricter nations. The United Nations and other multi-national groups continue to work for coordination. With the possibility of dead seas in 25 years, it is imperative that such agreements be reached. (Nielsen-Florida)
W72-08644

GETTING TOUGH: U.S. PRESSURE ON FIRMS TO CLEAN UP WATERWAYS BEGINS TO HAVE IMPACT,
B. Schorr.
Wall Street Journal, November 4, 1971, at 1, 13, Col. 1. 2 p.

Descriptors: *Industrial wastes, *Permits, *Rivers and Harbors Act, *Pollution abatement, Legal aspects, Legislation, Wastes, Sewage, Waste water treatment, Effluents, Waste storage, Lagoons, Water pollution control, Administrative agencies, Administrative decisions, Adoption of practices.
Identifiers: *Refuse Act.

An executive order, of April 1971, required that industrial discharges into navigable waterways be covered by federal permits or be subject to court action. The enforcement or threat of enforcement of this requirement is bringing some surprising gains in the drive to clean up industrial wastes. There are, however, administrative problems. The procedures involved in obtaining a permit are difficult and complex. Many plant managers elect to avoid the bother of seeking a permit by diverting wastes from navigable waterways to municipal sewage systems or holding them in treatment lagoons. New legislation is being planned to speed up the permit process. The enforcers, however, are not waiting for new laws. They are pressing ahead under existing permit provisions. (Nielsen-Florida)
W72-08645

THE SEARCH FOR EQUITY ON THE SEABEDS,
J. R. Stevenson.
Department of State Bulletin, Vol. 64, p 529-533 1971. Address to Indian Society of International Law at New Delhi on February 9, 1971.

Descriptors: *International law, *Law of the sea, *Equity, *Ownership of beds, Legal aspects, International waters, Resources development, Continental shelf, Continental margin, Water law, Resources, Resource allocation, Natural resources, Oceans, Exploitation, United States, United Nations, Beds, Beds under water, Relative rights, Foreign countries.
Identifiers: Coastal waters, Seabed.

The most important subject before the international legal community today is the law of the sea. Within that area, the most important problem is that of the seabed. The seabed has emerged as a source of great mineral wealth and natural resources. Inequities in the present system are manifold, and they result from inequality in the geographic, economic, or technological situations of states. President Nixon's proposal for a convention to establish an international regime beyond the point where the high seas reach a depth of 200 meters or at a 12-mile territorial sea is important. Key elements of the Nixon proposal are discussed. Only through an international regime with international sharing of benefits can more equity be introduced into the law of the sea relating to the seabed. Equity on the seabeds is not an elusive dream: it is a practical necessity if order and stability are to be maintained. (Nielsen-Florida)
W72-08646

ENVIRONMENT REPORT/INDUSTRIES WIN FEW CONCESSIONS AS POLLUTION PERMIT PLAN MOVES ON SCHEDULE,
J. R. Wagner.
National Journal, Vol. 3, p 932-938, 1971. 4 photo.

Descriptors: *Permits, *Water quality control, *Rivers and Harbors Act, *Industrial wastes, *Law enforcement, Legislation, Environmental effects, Legal review, Effluents, Discharge (Water), Water pollution sources, Legal aspects, Water quality standards, Regulation, Political constraints, Administrative agencies, Adoption of practices, Industrial plants, Federal government.
Identifiers: *National Environmental Policy Act, *Refuse Act.

The Environmental Protection Agency (EPA) and Corps of Engineers are going ahead with plans to implement the Refuse Act permit system by July 1, 1971. Regulations have been revised several times and are now tougher than before. Fish and wildlife, public hearings, review and certification, permit duration, application fees, appeals, and municipal exemptions are some of the topics considered. Effluent guidelines of the EPA are being prepared for 22 industrial categories; however, this is only the start. Application form problems are discussed. One concern of industry is that trade secrets might have to be revealed. Other factors are discussed, including: Justice Department enforcement, staff expansion, permit forms, and discharges of hazardous materials. Industry reaction and criticism are considered. Some major industrial uncertainty relates to who is in charge of the program, fear of lawsuits despite compliance, and conflicts between state and federal standards. Congressional reaction is discussed. Many uncer-

tainties in the program must be cured to prevent court challenges. (Grant-Florida)
W72-08647

UNITED NATIONS: TREATY ON PROHIBITING EMPLACEMENT OF NUCLEAR WEAPONS ON SEABED AND OCEAN FLOOR.

International Legal Materials, Vol. 10, p 145-151, 1971. append.

Descriptors: *Treaties, *United Nations, International law, International waters, Regulation, Water policy, Political aspects, Governments, Foreign countries, Water law, Water resources, Foreign waters, Law of the sea, Legal aspects, Oceans.
Identifiers: *Ocean floors, *Sea-beds, *Treaty on Prohibiting Emplacement of Nuclear Weapons on Seabed and Ocean Floor, Nuclear weapons, Coastal waters.

States party to this treaty undertake not to place any nuclear weapons or other weapons of mass destruction on the seabed, the ocean floor or the subsoil thereof. This treaty will not apply to the seabed beneath the twelve-mile limit of the territorial waters of any coastal state. Provisions are included for parties to verify through observation compliance of other parties. The treaty provides for consultation and cooperation to resolve any questions concerning the fulfillment of its obligations. If this is inadequate a party may refer the matter to the Security Council for action. Additionally, each party, after giving proper notice, shall have the right to withdraw from this treaty if it decides that extraordinary events related to the subject matter of the treaty have jeopardized its interests. This treaty shall enter into force after ratification by twenty-two governments. (Brackins-Florida)
W72-08648

EMINENT DOMAIN: PUBLIC PURPOSE AND CONSERVATION OF NATURAL RESOURCES,
For primary bibliographic entry see Field 05G.
W72-08650

CLEAN WATER PACKAGE,
U.S. Congress, Washington, D.C.; and House, Washington, D. C.
J. D. Dingell.
Congressional Record, Vol. 118, No. 44, P. E2834-2835 (daily ed.) March 22, 1972.

Descriptors: *Federal Water Pollution Control Act, *Water quality control, *Political aspects, *Legislation, Federal government, Water pollution control, Law enforcement, Penalties (Legal), Water quality standards, State governments, Governmental interrelations, Administrative agencies, Pollution abatement.

Representative Dingell introduced into the Record a letter, signed by 36 House Members, endorsing the clean water package of amendments to the Federal Water Pollution Control Act of 1972. The clean water package will require that, by 1981 without further action by Congress, polluters use the best available technology to prevent water pollution. It will also provide more national control over state discharge permit programs. This is needed to prevent economic hardship and interstate competition for industries, and to insure water quality objectives. Provisions giving immunity to polluters who violate the act or the Refuse Act merely because they file a permit application will be stricken. The right of citizens to sue polluters and the EPA will be equated with such rights under the Clean Air Act. Weakening of the National Environmental Policy Act and the Fish and Wildlife Coordination Act will be prevented. Finally, criminal sanctions will be established against polluters who willfully violate pollution orders. (Horwitz-Florida)
W72-08651

PROPOSAL OF THE WATER RESOURCES COUNCIL, INSTITUTING NEW CRITERIA FOR THE EVALUATION OF WATER RESOURCE PROGRAMS, CAUSES CONGRESSIONAL CONCERN--PROPOSED STANDARDS AND PROCEDURES FOR WATER RESOURCE PROJECTS,
Congress, Washington, D.C.; and Senate, Washington, D.C.
J. Randolph, and A. J. Ellender.
Congressional Record, Vol. 118, No. 39, p. S4030-4031 (daily ed.) March 15, 1972.

Descriptors: *Water resources development, *Federal government, *Economic justification, *Interest rates, Political aspects, Planning, Legal aspects, Administrative agencies, Comprehensive planning, Social aspects, Financing, Decision making, Financial feasibility, Project planning, Cost comparisons, Cost-benefit analysis, Interest.

Congress set forth, in section 209 of the Rivers and Harbors Act of 1970, a four-account system to be followed by the Water Resources Council in evaluating water resources development projects. The accounts relate to: (1) national income, (2) regional development, (3) environmental quality, and (4) social well-being of the people. The Council has ignored the social well-being of the people and has given little attention to regional development. New evaluation standards recommended by the Office of Management and Budget use the opportunity cost of money as the discount rate for judging projects. The market interest rate is unrealistic in light of long-range national water requirements. Water resources development is necessary for the Nation's continued existence; it should not be measured by short-term interest rates applied to profit-oriented projects. The discount rate should be based on the average interest payed by the Treasury on government securities. (Horwitz-Florida)
W72-08652

UNITED STATES V. (967,905 ACRES OF LAND, STATE OF MINNESOTA (CONDEMNATION OF RIPARIAN RIGHTS).
447 F.2d 764-774 (8th Cir. 1971).

Descriptors:*Minnesota, *Littoral, *Riparian rights, *Condemnation value, Condemnation, Legislation, Rivers and Harbors Act, Federal government, Legal aspects, Judicial decisions, Property values, Real property, Land use, Lakes, Land tenure, Navigation, Boats, Navigable waters, Right-of-way, Easements, Legal review.

Plaintiff United States brought a condemnation suit against defendant littoral landowners. Defendants claimed that the condemnation of the entire land surrounding the lake deprived defendants of any landbase for certain cabin barges and thus defendants ought to be compensated for the barges. Defendants also sought compensation for the value of their lands littoral rights. The Eighth Circuit Court of Appeals held that when the government condemns real property it is not required to pay either for personal property or for the cost of moving it and that under no concept of real property is a barge characterized as realty. The court also held that under the Rivers and Harbors Act of 1970 condemnation of property for public waterway improvement necessitates compensation to the property owner for loss of the economic and aesthetic value of the littoral rights in the property. Moreover, the government's existing rights in navigable waters did not include a littoral landowner's private rights. The court also ruled that condemnation for the purpose of preserving natural surroundings was 'improvement' within the meaning of the Act. (Grant-Florida)
W72-08653

A BILL TO AUTHORIZE THE SECRETARY OF THE ARMY TO INVESTIGATE, PLAN, AND CONSTRUCT PROJECTS FOR THE CONTROL OF STREAMBANK EROSION.
Congress, Washington, D.C.; and House, Washington, D.C.

House Bill 13218, 92d Cong, 2d Sess. (1972). 2 p.

Descriptors: *Stream erosion, *Channel erosion, *Federal government, *Erosion control, Projects, Estimated costs, Erosion, Deposition (Sediments), Reservoir operation, Sediment control, Channels, Land management, Easements, Right-of-way, Regulation, Administrative agencies, Federal project policy, Financing.

Projects authorized under terms of this bill would reduce damages from erosion, reduce the deposition of sediment in reservoirs and waterways, reduce destruction of channels and adjacent lands, and reduce other adverse effects of streambank erosion. No such project shall be undertaken if the estimated federal cost exceeds $500,000. $10,000,000 per annum would be appropriated for construction. Appropriate nonfederal interest shall undertake to: (1) provide all necessary lands, easements, and rights-of-way without cost to the United States; (2) hold the United States free from damages due to construction; (3) operate and maintain works after completion in accordance with regulations prescribed by the Secretary of the Army; and (4) provide such additional cooperation as the Secretary of the Army, acting through the Chief of Engineers, deems appropriate. (Waldron-Florida)
W72-08654

THE UNITED STATES DRAFT TREATY ON THE INTERNATIONAL SEABED AREA--BASIC PRINCIPLES,
Cambridge Univ. (England).
R. Y. Jennings.
International and Comparative Law Quarterly, Vol. 20, p. 433-452, 1971. append.

Descriptors: *Treaties, *International law, *Continental shelf, *Law of the sea, *Oceans, Legal aspects, Boundaries (Property), Boundary disputes, Ownership of beds, Coasts, Continental margin, Continental slope, International waters, Foreign countries, Governments.
Identifiers: *Seabed treaty, International seabed area.

The twelve Articles of Chapter 1 of the United States draft treaty on the International Seabed Area present certain problems. For example, what is the status of a party to the treaty who withdraws. Such a renunciation would end the rights and benefits conferred by the Convention on the International Seabed Areas. Also, since the general rule is that a treaty has no effect on a third party state (non-signatory) without its written consent, conflict could arise because the treaty includes a 'non-recognition' clause which declares that no state has any right, title or interest in the seabed area except through the treaty. Furthermore, the provision calling for the coastal state to renunciate its lawful jurisdiction and control over its own continental margin is unnecessary. Simple renunciation of the natural resources of the area to ensure that this wealth is regarded as the common heritage of mankind would accomplish the same goal without affecting sovereign rights. Problems could also arise where the proposed territorial limit at the 200 meter mark on the continental shelf is less than the territorial limits presently claimed by a state. An intermediate zone could be established to remedy such situations. (Nielsen-Florida)
W72-08655

WATER POLLUTERS TANGLE WITH THE LAW--AND LOSE.

Business Week, p. 64-65, October 9, 1971. 1 photo.

Descriptors: *Rivers and Harbors Act, *Industrial wastes, *Judicial decisions, *Permits, Legal aspects, Administrative agencies, Penalties (Legal), Water quality control, Water quality standards, Navigable waters, Adoption of practices, Texas, Industrial water, Waste disposal wells, Water pollution, Heat treatment, Water pollution sources, Politicial aspects, Legal review.
Identifiers: *Injunctions (Prohibitory).

The Nixon Administration's plan to use the little known Refuse Act of 1899 to crack down on water pollution at first met with little success. However, the Environmental Protection Agency (EPA) recently asked the Justice Department to sue 28 companies which had not applied for waste discharge permits. The first case to reach trial involved the Armco Steel plant on the Houston Ship Channel. Armco had decided to stop routinely dumping a variety of harmful chemicals in the channel and instead commenced drilling two 7,000 foot wells to store the wastes. While the drilling was approved by the Texas Water Quality Board, EPA objected and obtained an injunction halting that activity on grounds that the wastes could seep into water supplies. The court banned use of the wells unless 18 nearby unused oil wells were plugged to prevent waste seepage. The cost of implementing this condition effectively shut down the plant. The case is now on appeal. EPA favors a treatment process with incineration of the residue. In another case U.S. Steel submitted waste discharge permit applications but company officials failed to sign the requisite forms. These signatures were obtained after other companies similarly situated failed to take similar action. The government clearly intends to enforce the permit system. (Grant-Florida)
W72-08656

THE STORMY DEBATE OVER 'ZERO DISCHARGE'.

Business Week, p. 70-71, February 5, 1972.

Descriptors: *Legislation, *Federal Water Pollution Control Act, *Water pollution, *Recycling, Administration, Water pollution sources, Water pollution treatment, Municipal wastes, Industrial wastes, Effluents, Sewage effluents, Rivers, Water quality control, Pollution abatement, Waste water treatment, Waste treatment.
Identifiers: *Zero discharge.

The Federal Water Pollution Control Act of 1971 establishes a tight timetable to achieve elimination of all effluent discharges into the nation's waterways--zero discharge--by 1985. The Nixon Administration, some economists, and virtually all business groups oppose the bill. Criticism centers around the cost of converting to machines capable of recycling waste water. However, if costs outweigh benefits, Congress has reserved the power to eliminate zero discharge as a national goal. The bill represents a change in philosophy from the 1965 act which permitted each state to set its own water quality standards. The new bill also ended the long-standing policy assumption that assimilation of waste was one legitimate waterway use. There are signs that the price tag on zero discharge will not be as high as opponents fear. Several companies are already operating plants which have achieved zero discharge through recycling. The toughest zero discharge problem will confront municipalities in disposal of waste. One solution lies in 'land disposal'. Municipal waste can be routed through relatively simple treatment, stored in holding lagoons and then sprayed on nearby farmland. (Nielsen-Florida)
W72-08657

DUMPING OF WASTE MATERIALS.

Congressional Quarterly Weekly Report, Vol. 29, p. 2548-2549, December 11, 1971.

Descriptors: *Waste disposal, *Legislation, *Water pollution control, *Federal government, *Pollution abatement, Water pollution, Oceans, Great Lakes, St. Lawrence River, Regulation, United States, Permits, Penalties (Legal), International waters, Federal budgets, Legal aspects, Water resources, Water quality control, Water law, Research and development.
Identifiers: *Coastal waters, Injunctions (Prohibitory).

The Senate and the House have passed slightly different versions of the Marine Protection and Research Act of 1971. The Act regulates the dumping of waste materials in the oceans, Great Lakes, and St. Lawrence Seaway; it establishes a research program on ocean dumping. The Senate bill prohibits the transportation out to sea or the dumping into territorial waters of any radiological, chemical, or biological warfare agent or high-level radioactive waste. The dumping of wastes other than those specifically banned requires the issuance of a permit by the Environmental Protection Agency or the Corps of Engineers. Criteria for such permits are listed. The Coast Guard has responsibility for surveillance and enforcement. The Act carries both civil and criminal penalties. Private citizens, as well as the government, are authorized to seek injunctions against violations of the Act. The Act also authorizes research programs into the effects of waste dumping, pollution, overfishing, and man-induced changes on ocean eco-systems. The major difference between the Senate and House versions is that the latter contained provisions establishing marine sanctuaries. (Blank-Florida)
W72-08658

SUMMARY PROCEEDINGS--CONFERENCE ON THE DEEP SEAS AND CONTINENTAL SHELF.

Cornell International Law Journal, Vol. 3, No. 2, p. 141-151 (1970).

Descriptors: *International law, *Continental shelf, *Law of the sea, *Oceans, Legal aspects, Boundaries (Property), Boundary disputes, Ownership of beds, Relative rights, Foreign countries, Jurisdiction, International waters.
Identifiers: *Archipelagos, Coastal waters.

Eleven distinguished authorities in law, engineering, science, and diplomacy participated in the Conference. Discussion revolved around the 1958 Continental Shelf Convention, current law and its effect on archipelagos, the military, and the establishment of a sea-bed regime. Early discussion considered how far out a coastal state's claim should carry on the continental shelf. The present Convention definition is 200 meters depth and 'where exploitable'. There are three criteria for determining shelf jurisdiction: (1) perimeter (mile limit), (2) depth, and (3) exploitation. Shelf jurisdiction is particularly important when discussing ocean archipelagos. Archipelago related interests include the continental shelf, fishing rights, and national unity. Of particular importance to the rest of the world is the preservation of free and open passage in sea lanes passing through archipelagos. Nations should be prohibited from using the ocean floor for military uses. Problems posed in establishing a seabed regime include access, controls, liability, and profit-sharing. There are three basic possible systems of control: (1) international registry, (2) international leasing (concessions), and (3) international exploitation. (Nielsen-Florida)
W72-08659

THE CONTINENTAL SHELF AND THE FREEDOM OF THE HIGH SEAS,
United Nations Secretariat. General Legal Div.
F. Labastida.
Cornell International Law Journal, Vol. 3, No. 2, p. 133-140 (1970).

Descriptors: *International law, *Continental shelf, *Law of the sea, *Oceans, Legal aspects, Boundaries (Property), Beds, Relative rights, Foreign countries, United Nations, Exploitation, Natural resources, Non-structural alternatives, Boundary disputes, Ownership of beds.

The emergence of intense national interest in granting the coastal state exclusive rights over the resources of the continental shelf introduces novel problems in light of freedom of the high seas. The continental shelf doctrine extended the authority of the coastal state, beyond the limits of the territorial sea, over the submarine areas adjacent to its coast. The regime of the continental shelf tends to have a detrimental effect at the expense of all other activities. Any conflict of rights is regulated by the rule prohibiting 'unjustifiable interference'. The rule's meaning is not precise and requires further and more precise regulation. The greatest uncertainty created by the continental shelf principle is probably the lack of a precise boundary. Originally, the doctrine laid claim only to submerged areas that might be regarded as land mass extensions. Reliance on exploitation has nullified the requirement of adjacency. The solution to the boundary problem is political. International registration of claims, international agency leasing, and regulation or international control are suggested alternatives. (Nielsen-Florida)
W72-08660

AN ACT RELATING TO WATER POLLUTION CONTROL AND ESTABLISHING THE MINNESOTA STATE WATER POLLUTION CONTROL FUND.
Minnesota Laws, ch. 953 (1971). 9 p.

Descriptors: *Minnesota, *Financing, *Water pollution control, *Legislation, Bond issues, Budgeting, Costs, Government finance, Grants, Interest, Principal, Loans, Government supports, Taxes, Municipal wastes, Community development, Project planning, Legal aspects, Payment, Regional economics, State governments, Administrative agencies.

Having determined that state financial assistance for the construction of water pollution prevention and abatement facilities for municipal disposal systems is a public purpose, Minnesota created a state water pollution control fund as a separate bookkeeping account to record receipts of the proceeds of state bonds and other money appropriated to the fund and disbursements of funds to agencies and subdivisions of the state for the prevention, control, and abatement of water pollution. Disbursements from the fund shall be made by the state treasurer upon order of the state auditor in accordance with the federal laws and regulations and the state appropriation acts governing such disbursements. High priority shall be given to applications from municipalities which because of a limited tax base, excessive bond indebtedness, or critical water pollution conditions would face extreme financial hardship without the assistance provided by this act. Details of fund operation are included. (Blank-Florida)
W72-08662

AN ACT RELATING TO POLLUTION CONTROL AND PROHIBITING CLEANING AGENTS AND CHEMICAL WATER CONDITIONERS CONTAINING CERTAIN NUTRIENTS.
Minnesota Laws, ch. 896 (1971). 5 p.

Descriptors: *Minnesota, *Water quality control, *Detergents, *Chemicals, Water pollution control, Domestic wastes, Cleaning, Legal aspects, Penalties (Legal), Water treatment, Inorganic compounds, Phosphorus compounds, Phosphates, Nutrient removal, Eutrophication, Aquatic productivity, Pollutants, Chemical wastes, Water pollution sources.

This act is intended to encourage the Minnesota pollution control agency to set standards limiting the amount of nutrients in various cleaning and water conditioning agents. The act prohibits the manufacture for use or sale in Minnesota or the importing into Minnesota for resale any cleaning agent or chemical water conditioner which contains a prescribed nutrient in a concentration greater than the maximum to be set by the pollution control agency. The pollution control agency is authorized to seize a cleaning agent or chemical water conditioner which it reasonably believes was manufactured or imported in violation of this act. The act also prohibits the sale or display for sale by manufacturers, wholesalers, or retailers of household laundry or dishwashing compounds unless test verification of the percentage content of phosphorous is filed with the pollution control agency. The act further requires a list stating the phosphorous content of household laundry or dishwashing compounds to be prominently displayed near the product display. Depending upon the specific section violated, violators shall be fined $5,000 for each offense or be guilty of a misdemeanor. (Blank-Florida)
W72-08663

EXPANDING THE ROLE OF MUNICIPAL POLICE POWER IN POLLUTION CONTROL: A PRAGMATIC APPROACH,
W. B. Rosenbaum.
Buffalo Law Review, Vol. 21, p. 139-174, Fall 1971. 36 p, 215 ref.

Descriptors: *Local governments, *Pollution abatement, *Legal review, *Water pollution control, New York, Legal aspects, Air pollution, Solid wastes, Waste disposal, Phosphates, Judicial decisions, Legislation, Governmental interrelations, Political constraints, Federal government, State governments, Constitutional law, Regulation, Cities, Non-structural alternatives, Institutional constraints.

Local government may be an effective force in solving current pollution control problems, due to its more flexible and pragmatic approach. A successful example of local control in Suffolk County, New York is cited. Criteria for the exercise of municipal power and grants of power are discussed, including: enabling authority, inconsistency and preemption, reasonableness and local objectives, and conflict with federal powers and legislation. The Suffolk County law appears to be valid. The inadequacies of federal and state pollution control action are discussed, including: congressional inaction, the potential of the federal commerce power as a control on pollution, and the failure of state action. Local measures which have been directed at controlling pollution are reviewed. Local control is an untapped but potentially effective institution for controlling pollution. Cases and legislation are analyzed with respect to air and water pollution, solid waste problems, and enforcement of local pollution laws. An example of enlightened municipal control of air pollution is New York City. (Grant-Florida)
W72-08664

THE STORY OF THE WATER SUPPLY FOR THE COMSTOCK,
Geological Survey, Carson City, Nev.
H. A. Shamberger.
Available from GPO, Washington, D.C. 20402, Price 70 cents (Paper cover). Geological Survey Professional Paper 779, 1972. 53 p, 26 fig.

Descriptors: *Water supply, *Mining, *Nevada, *History, Reviews, Water users, Water supply developments, Hydrogeology, Pipelines, Aqueducts, Legal aspects, State governments, Documentation, Water yield, Water quality, Water requirements, Planning, Design, Gold.
Identifiers: *Comstock Lode (Nev), Virginia City (Nev), Gold mining.

Various historical water problems are cited and their solutions discussed as they relate to water needs of the mining towns, Virginia City and Gold Hill, Nevada. Springs furnished most of the needs when the first mining was done in the 1850's. The springs and a few dug wells sufficed as a water supply until the growing population by 1860 demanded more water. Two companies, formed to collect and distribute water, were consolidated in May 1862 as the Virginia and Gold Hill Water Company. In October 1863 only 664 gallons per hour could be delivered to Virginia City customers at exorbitant prices. Of this 48 gallons came from the Santa Rita mine tunnel. Snowmelt recharged the failing springs and dug wells temporarily. As these sources dried up, tunnels were extended into the hills to find new aquifers, which, too, slowly failed. The plans, design, and construction of three pipelines to bring water 5 mi or more from the Sierra Nevadas are described. Details are given of the engineering, building, and management of these systems completed in 1873, 1875, and 1887. Total capacity of the system after 1887 was 10 mgd. In April 1933 the system became The Virginia City Water Company, which in the 1960's was acquired by the State. The report also describes how increasing inflow of water into the deep (3,000 ft or more) mine shafts caused insurmountable problems and resulted in discontinuation of deep mining on the Comstock in 1886. (Lang-USGS)
W72-08760

ENVIRONMENTAL LAW -- STANDING TO SUE,
L. Chipley.
Land and Water Law Review, Vol. 6, No. 2, p 527-535, 41 ref, 1971.

Descriptors: *Water law, *Public rights, State jurisdiction, Legislation, Legal aspects, Administrative decisions, *Environment.

The perennial difficulty of individuals and groups to bring suits for the protection of the environment is analyzed. In distinguishing appeals from administrative decisions and suits brought to abate public nuisances, attention is drawn to the former as the genesis of a liberalizing trend. The trend is spreading not only to public nuisance law but also to new state statutory enactments.
W72-08762

STATE MANAGEMENT OF GROUND WATER MINING: A SYSTEM BASED ON POLICY, FACT AND THEORY; FUNDINGSLAND V. COLORADO GROUND WATER COMM., 468 P. 2D 835 (COLO. 1970),
B. Laughlin.
Land and Water Law Review, Vol. 6, No. 2, p 568-576, 25 ref, 1971.

Descriptors: *Water law, *Groundwater mining, Administrative decisions, *Judicial decisions, *Well permits, Legal aspects, Water rights, Water allocation (Policy), Mining, *Colorado.

A recent case is discussed in which the Colorado Supreme Court upheld the decision of the Colorado Ground Water Commission denying plaintiff's application for a permit to drill a well. The history of groundwater statutes and policy considerations in allocation of groundwater resources are reviewed. It is concluded that courts will generally uphold an administrative agency's determination with respect to an application for a permit to drill for groundwater. The reason suggested for this judicial concurrence is the unavailability to plaintiffs of evidence countervailing that which is introduced by the agency.
W72-08763

AGRICULTURAL IRRIGATION AND SALINE QUALITY OF WATER,
W. R. Shelledy, Jr.
Land and Water Law Review, Vol. 5, No. 2, p 490-498, 38 ref, 1970.

Descriptors: Water law, Irrigation, *Agricultural runoff, *Wyoming, *Irrigation effects, *Water pollution control, *Salinity, Water quality, Legal aspects, Economics.

A portion of the water pollution problem is caused by the concentration of dissolved salts in water. Salinity is often the effect of irrigators' application of more water than required for maximum plant growth. The Wyoming Statutes and Wyoming's water quality standards pursuant to the Federal Water Quality Act of 1965 provide little hope for relief from this type of pollution. Abatement of saline pollution is mostly an economics problem.
W72-08766

WATER LAW - ARTIFICIAL VERSUS NATURAL FLUCTUATION OF WATER LEVEL OF NAVIGABLE LAKE - RIGHTS OF PUBLIC HELD SAME IN BOTH SITUATIONS,
B. T. Ahlstrom.
Land and Water Law Review, Vol. 5, No. 2, p 517-528, 25 ref, 1970.

Descriptors: Water law, *Washington, *Public rights, Lakes, Navigable waters, State jurisdiction, Judicial decisions, Water rights, Legal aspects, Riparian rights, *Ownership of beds.

A recent decision of the Washington Supreme Court is analyzed. While Washington does not distinguish between public and private ownerships of beds underlying water, a more appealing case is presented for abatement of fills when public ownership is involved. Furthermore, the Washington court correctly refused to distinguish between artificial and natural fluctuations of water levels.
W72-08767

THE U.S. WATER QUALITY PROGRAM: DESPERATE NEED FOR PLANNING,
For primary bibliographic entry see Field 05G.
W72-08797

THE U.S. WATER QUALITY PROGRAM: BIG BOOST NEEDED FOR R AND D,
For primary bibliographic entry see Field 05D.
W72-08798

A BILL TO ESTABLISH POLICY AND PRINCIPLES FOR PLANNING THE USE OF THE WATERND RELATED LAND RESOURCES OF THE UNITED STATES (NATIONAL WATER AND RELATED LAND RESOURCES POLICY ACT).
House Bill 13768, 92d Cong, 2d Sess. (1972). 29 p.

Descriptors: *Legislation, *Water policy, *Project planning, *Decision making, Water law, Legal aspects, Economic impact, Environmental effects, Environmental control, Social impact, Social needs, Regional development, Planning, Administration, Evaluation, Coordination, Analysis, Cost analysis.
Identifiers: *National Water and Related Land Resources Policy Act.

The bill would establish as national policy that planning the use of the water and related land resources shall be undertaken and conducted so as to achieve the objectives of national economic development, environmental quality, social well-being, and regional development. Planning for use of resources in terms of these objectives will be conducted so as to identify alternative plans and to provide information needed to improve the decision making process. The Water Resources Council will administer the Act. The bills objectives are listed. It defines values to be used in considering these objectives and lists general evaluation principles for measurement of benefits and costs, determination of the discount rate, consideration and comparison of alternatives, period of analysis, scheduling, risk and uncertainty, data sensitivity analysis, and updating plans. Guidelines for formulation of alternate plans include multiobjective

component specification, evaluation of conditions without plan, alternate plan analysis, specified multiobjective component reconsideration, and selection of a recommended plan. The bill also sets forth the system of accounts, programs and activities covered, and implementation and effect on existing law. (Ilkson-Florida)
W72-08826

UNITED STATES V. HERCULES, INC, SUNFLOWER ARMY AMMUNITION PLANT, LAWRENCE, KANSAS, (REFUSE ACT VIOLATIONS).

335 F. Supp. 102-107 (D. Kan. 1971).

Descriptors: *United States, *Waste disposal, *Judicial decisions, *Rivers and Harbors Act, *Ammonia, *Pollution abatement, *Water pollution, Navigable rivers, Water pollution control, Legal aspects, Water law, Water pollution sources, Water quality, Federal jurisdiction, Wastes, Industrial wastes, Water resources, Law enforcement, Navigable waters, Waste water disposal, *Kansas.
Identifiers: *Refuse Act, *Lawrence (Kan).

Plaintiff United States brought criminal charges against defendant ammunition manufacturing corporation for discharging ammonia wastes into a navigable river's tributary in violation of the Refuse Act. Plaintiff asserted ten violations of the Act. Defendant contended that: (1) the Act was unconstitutionally vague, since ammonia is naturally present in water and its status as 'refuse' could not be known; (2) plaintiff's enforcement of the Act was discriminatory and denied defendant equal protection; and (3) the discharge had been into a tributary of a tributary of a navigable river and, therefore, was not within the power of Congress to regulate. The United States district court held that: (1) the Act is not unconstitutionally vague; (2) ammonia is 'refuse'; (3) selective enforcement of a statute does not deny equal protection unless invidious and based upon an arbitrary standard; and (4) regardless of the precise point of origin, Congress has constitutional authority to regulate refuse discharges into navigable waters. The court ruled that only one managerial decision was made and that the discharge was precipitated by one impulse and a singleness of purpose. Therefore, nine of ten counts against were ordered stricken. (Brackins-Florida)
W72-08830

CONGRESSMAN SEBELIUS INTRODUCES BILL TO BASE FUTURE PLANNING FOR WATER AND LAND RESOURCES,
Congress, Washington, D.C.; and House, Washington, D.C.
K. G. Sebelius.
Congressional Record, Vol. 118, No. 37, p. H1982 (daily ed.) March 13, 1972.

Descriptors: *Water resources development, *Political aspects, *Planning, *Standards, *Decision making, Legislation, Federal government, Project planning, Government finance, Economic justification, Economic feasibility, Resources development, Regional development.

Representative Sebelius introduced a bill to base future planning for water and land resources on four broad objectives: national economic development, environmental quality, quality of life, and regional development. Under present procedures plans are formulated under rigorous economic standards to achieve maximum net economic benefits. This approach has not worked well and is deemed discriminatory. Primary weight has been given to monetary values which favor densely populated metropolitan centers at the expense of rural and small-town areas. Present procedures, coupled with the 7% discount rate for water resources programs proposed by the Office of Management and Budget, jeopardize 90% of the proposed water resource projects in the Nation as well as most of the Great Plains water resource developments for the next four years. Representative Sebelius stressed the need for water resource development based upon the multiobjective approach to planning which will give the Nation's rural areas an equal opportunity for future development. (Horwitz-Florida)
W72-08832

DEEP SEABED HARD MINERAL RESOURCES ACT.
House Bill 13076, 92nd Cong, 2d Sess. (1972). 13 p.

Descriptors: *Legislation, *Beds under water, *Exploitation, *Mining, *United States, Law of the sea, Permits, Royalties, International waters, International law, International commissions, Mineral industry, Legal aspects, Jurisdiction, Regulation, Governmental interrelations, Insurance, Beds, Ownership of beds, Exploration, Leases.

The Bill is intended to promote conservation and orderly development of hard mineral resources of the deep seabed, pending institution of an international regime. The Secretary of the Interior would administer the Act and prescribe regulations. The Secretary would issue exclusive licenses subject to certain limitations and conditions. The Act contemplates the designation of an international registry clearinghouse to keep records of licenses. Pending designation of such clearinghouse, the Secretary would act in its place. Certain areas are withdrawn from licensing and no applicant may hold licenses exceeding certain density limitations. Each licensee shall make minimum expenditures for development at established rates. Provisions for relinquishment, transfer, and loss of licenses are set forth. To assist developing reciprocating states, a percentage, determined by Congress, of license fees and tax revenues attributable to the recovery of resources would be deposited in an escrow account. On annual payment of an amount determined by Congress, the United States would insure the risk of loss for each licensee. There would be no discrimination between minerals recovered from the deep seabed and minerals recovered within the United States. Penalties, judicial jurisdiction, and rights of action are defined. (Ilkson-Florida)
W72-08833

CLARK V. VILLAGE OF MILAN (CONSENT OF ADJOINING LANDOWNERS REQUIRED TO OBSTRUCT LEVEE).
277 N.E.2d 895-898 (3d D. App. Ct. Ill. 1972).

Descriptors: *Illinois, *Judicial decisions, *Cities, *Riparian rights, Streams, Creeks, Levees, Canals, Flood control, Channel improvement, Drainage, Legislation, Legal aspects, Highways, Watercourses (Legal aspects).
Identifiers: *Class action, *Indispensable parties.

Plaintiff landowners sought a declaratory judgment to the effect that defendant town had no interest in plaintiffs' lands and that plaintiffs had the right to fill a creek on that land. Since there was a canal in this region, a levee had been built on the south bank of the creek to protect adjoining lands from floods. Defendant claimed that it had the right to clear out the channel and to drain its lands into the channel. Several persons who owned property adjoining the creek were not made parties to the action. The highway authority also was not made a party even though the creek served as a drain for a state highway. The court refused to rule on plaintiff's action because indispensable parties were not named in the action. The court stated that no drain or levee could be obstructed without the consent of all landowners who were benefited by the drain or levee. (Waldron-Florida)
W72-08834

LARSON V. VILLAGE OF CAPRON (SEWAGE DRAINAGE BY UPLAND OWNER).

278 N.E.2d 830-833 (2d D. App. Ct. I11. 1972).

Descriptors: *Tiles, *Illinois, *Drainage water, *Intermittent streams, *Municipal wastes, Surface drainage, Sewage disposal, Waste water disposal, Waste treatment, Treatment facilities, Flood damage, Judicial decisions, Damages, Waste water (Pollution), Watercourses (Legal aspects), Cities.

Plaintiff farmers brought an action seeking an injunction and damages as a result of defendant town's drainage of sewage across plaintiffs' lands. A tile ran the course of an intermittent stream. Fifty years ago plaintiffs had permitted a factory to construct the tile to carry water and waste. Several plaintiffs later had connected lateral tiles to the main tile. Defendant connected a discharge pipe from its sewage treatment plant to the tile. Plaintiff's lands were flooded as a result of the excess flow from defendant's plant. The court held that even though the tile ran along an intermittent stream, it could not be used for the transmission of sewage effluent. The principle of law which permits the owner of a higher piece of property to drain surface water along the natural course of drainage onto lower estates did not apply because defendant drained sewage rather than water. Plaintiffs were granted an injunction because extensive damages would have continued as long as defendant used the tile. Three plaintiffs were awarded damages. (Waldron-Florida)
W72-08835

PRESENT MILITARY USES OF THE SEABED AND FORSEEABLE DEVELOPMENTS,
Ministry of Foreign Affairs, Oslo (Norway). Judicial Dept.
J. Evensen.
Cornell International Law Journal, Vol. 3, p. 121-132, 1970. 24 ref.

Descriptors: *Military aspects, *Oceans, *Continental shelf, *International law, Treaties, International waters, Law of the sea, Navigation, Legal aspects, Submarines, Exploitation, Structures, Underground structures, Radioactivity, Nuclear explosions, Continental margin.
Identifiers: Nuclear weapons, Seabeds, Ocean floor.

Use of the ocean floor and its subsoil for military purposes might result in destroying the traditional freedom of super-adjacent waters for fishing and navigation. Nuclear weapon emplacement on the ocean floor also could result in ocean pollution. The present military uses of the ocean floor are: mines, nuclear power submarines armed with missiles, tracking devices, and nuclear testing. Future military uses include: deep sea submarines and vehicles for use on the ocean floor, underwater depots, launch platforms, and sea bed missile emplacements. United States and Russian proposals for use of the seabed for military purposes are discussed. These proposals were incorporated in a joint draft treaty prohibiting the use of weapons of mass destruction and any fixtures or installations for their storage on the ocean floor. However, this prohibition would only apply to an area outside a narrow band of national waters; while the draft is regarded as an achievement, many are suspect of this attempt to bilaterally carve up the ocean floor. (Grant-Florida)
W72-08837

ENVIRONMENT REPORT/ECONOMIC ARGUMENTS MAY FORCE RETREAT FROM SENATE WATER-QUALITY GOALS,
For primary bibliographic entry see Field 05G.
W72-08839

THE EFFECT OF WATER POLLUTION CONTROL LAWS ON THE LOCATION OF PULP AND PAPER MILLS,
Braniff Graduate School of Management, Irving, Tex.
For primary bibliographic entry see Field 05G.
W72-08841

U.S. AND CANADA HOLD MEETING ON GREAT LAKES POLLUTION (JOINT COMMUNIQUE).

Department of State Bulletin, Vol. 64, p. 828-831, 1971.

Descriptors: *International law, *Canada, *United States, *Water quality control, *Great Lakes, *Pollution abatement, International commissions, Waste water (Pollution), Waste water treatment, Sewage treatment, Waste treatment, Thermal pollution, Toxins, Toxicity, Mercury, Phosphorus, Legislation, Federal government, Foreign countries, International Joint Commission, Oil spills.
Identifiers: Mercury pollution.

Ministers and representatives of the Governments of Canada and the United States met to discuss problems of pollution in the Great Lakes. The meeting included a review of accomplishments since their first meeting one year earlier. Current programs, legislation, and proposals in each country to improve water quality in the Great Lakes were reviewed. Also reviewed was a report by the Joint Working Group on Great Lakes Pollution. The Group's recommendations were accepted. It was also agreed to conclude an agreement on water quality, including: (1) construction of treatment facilities, (2) reduction of phosphorus discharges, (3) elimination of toxic heavy metals from discharges, and (4) control of thermal pollution. Also included were items regulating ship design, control of vessel waste discharges, and emergency plans for oil spills. Additional authority should be given to the International Joint Commission to assist in efforts to restore and protect Great Lakes water quality. Other technical delegations of powers and responsibilities were made to achieve the agreed upon common water quality objectives by 1975. (Nielsen-Florida)
W72-08842

CONVEYANCES OF SOVEREIGN LANDS UNDER THE PUBLIC TRUST DOCTRINE: WHEN ARE THEY IN THE PUBLIC INTEREST,
S. D. Rees.
University of Florida Law Review, Vol. 24, p. 285-307, Winter 1972. 174 ref.

Descriptors: *Florida, *Riparian rights, *Ownership of beds, *Public rights, Legal review, Governmental interrelations, Regulation, Legal aspects, Public lands, Public access, Eminent domain, Judicial decisions, Riparian land, Legislation, Navigable waters, Riparian waters, Dredging, Bulkheads, State governments, Constitutional law.
Identifiers: *Public trust doctrine.

The public trust doctrine in Florida, by which the state holds title to beds of navigable waters for the public good, is judicial in origin. Not until Florida adopted its present constitution in 1968 did the trust theory, with its restrictions on alienability of submerged lands, find constitutional expression. Florida cases and statutes are examined to determine what elements comprise the public interest which is the limitation placed on Florida's ability to dispose of sovereign land. The rationale by which the state justifies transfers of sovereign lands is explored, and suggestions are made concerning limits to the application of the trust doctrine. Conveyances to promote the general public welfare, conveyances to riparians, legislation to regulate fishing, and the dredging and filling of submerged lands are explored. Special attention is given to Florida's Bulkhead Act which represents a conscious effort to create a sensible, uniform program to evaluate bulkheading and filling conditions detrimental to the public interest. (Horwitz-Florida)
W72-08844

LAW OF THE CONTINENTAL SHELF AND OCEAN RESOURCES--AN OVERVIEW,
Cornell Univ., Ithaca, N.Y. School of Law.
H. A. Freeman.
Cornell International Law Journal, Vol. 3, No. 2. p. 105-120, 1970. 66 ref.

Descriptors: *Law of the sea, *Ownership of beds, *Political constraints, *Continental shelf, *International law, Internation commissions, Legal review, Coasts, Oceans, Navigation, Legal aspects, Jurisdiction, Public rights, International waters.

The law of the sea is traced from antiquity to the present. Concepts of the law of the sea should be developed around a theory that answers the political-ecological needs of mankind. Rights in the seabed, including the continental shelf, should belong to and serve mankind generally, rather than being monopolized by certain countries. Recent developments are considered, beginning with President Truman's two proclamations in 1945. These proclamations stated that the United States regarded the natural resources of the subsoil and seabed of the continental shelf beneath the high seas but contiguous to the coast of the United States as subject to its jurisdiction and control. As a result of these proclamations similar claims by other countries were asserted. The Geneva Conference and the Shelf Convention were conveyed to deal with the problems of exploitation and control of the sea. The conventions are examined in detail with attention to the positions taken by participating nations. Proposals for the future regime of the deep seabed are also put forth. (Horwitz-Florida)
W72-08848

WATER POLLUTION CONTROL LEGISLATION, PART 4.
Congress, Washington, D.C.; and Senate, Washington, D.C. Subcommittee on Air and Water Pollution.
For primary bibliographic entry see Field 05G.
W72-08851

THE VITALITY OF THE NAVIGABILITY CRITERION IN THE ERA OF ENVIRONMENTALISM,
W. W. Nixon.
Arkansas Law Review, Vol 25, p 250-287, Fall 1971. 178 ref.

Descriptors: *Navigable waters, *Riparian rights, *Legal review, *Federal jurisdiction, *State jurisdiction, Arkansas, Legal aspects, Judicial decisions, Ownership of beds, Reasonable use, Common law, Constitutional law, Water law, Public rights, Public access, Water pollution, Water quality control, Water pollution control, Governmental interrelations, Relative rights.

The problem of defining 'navigability' and some of the tests which have been used to decide if a water body is navigable are examined. Federal standards of navigability, including the relationship to the commerce clause, are extensively explored. State standards of navigability are also discussed. State questions of navigability often involve questions of riparianism and bed title, while federal questions often involve questions of commerce. Arkansas case law is heavily relied upon. The state trend away from strict factual navigability is discussed as is the question of who decides navigability. The difference in legal treatment of navigable and non-navigable waters is considered, including: public rights dependant upon navigability, private rights involved in the determination, maritime jurisdiction of federal and state courts, and the fact that state and federal courts are not bound by each other's finding of navigability. Whether through expansion of the navigability concept or police power legislation, public rights in waterways must be protected to prevent environmental degradation. Legitimate rights of riparian landowners, however, must not be impaired. (Grant-Florida)
W72-08854

USE OF EVAPOTRANSPIRATION INFORMATION BY STATE WATER RESOURCE AGENCIES,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 02D.
W72-08925

THE RELATIONSHIP BETWEEN HOUSING AND WATER RESOURCES PLANNING AND MANAGEMENT,
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W72-08952

PLANNING, THE LAW, AND A QUALITY ENVIRONMENT,
San Francisco Bay Conservation and Development Commission, Calif.
J. E. Bodovitz.
In: No Deposit - No Return (Man and His Environment: A View Toward Survival), Addison-Wesley Publishing Company, 1970. p 179-190.

Descriptors: *Planning, *Legal aspects, *Environmental control, *Conservation, Research and development, Project planning, Resources development.
Identifiers: *San Francisco Bay Conservation and Development Commission (BCDC), *Development, Interdisciplinary approach.

Recognition is needed that both conservation and development are going to be required in the physical environment of the United States. The work of the San Francisco Bay Conservation and Development Commission (BCDC) which began in late 1965 is described. The BCDC was to make studies of the Bay, to plan for the Bay, and to protect the Bay from unnecessary filling. BCDC was composed of 27 individuals from federal agencies, state agencies, cities, and counties, while the general public was represented through appointments made by the Governor and each house of legislature. The Commission conducted reports on 25 different aspects of the Bay, ranging from the importance of marshlands to the importance of waterfront industry. Information was sought from many disciplines, including the legal field. The BCDC recommended: (1) that the Bay should be regarded as the most valuable natural asset of the entire Bay region, (2) that the Bay should be improved and protected for posterity, (3) that the Bay can play an increasing role as a major world port, and (4) that the Bay can simultaneously develop job-producing industries and new recreation facilities. (Strachan-Chicago)
W72-08957

NATURE AND MAN AND WATER,
Congress, Washington, D.C.; and Committee on Public Works (U. S. House).
J. Wright.
Water Spectrum, Vol. 4, No. 1, p 11-15, Spring 1972. 4 photo.

Descriptors: *Water resources development, *Environment, *Water quality control, *Planning, *Decision making, Conservation, Ecology, Economics.
Identifiers: *Environmental Policy Act, Policy making, Balanced outlook, Public interest.

The price paid for past public neglect of environmental concerns is an hysterical over-reaction. The Environmental Policy of 1969 has been in-

terpreted as 'trumpet call' to halt the development of the Nation's water resources. The Environmental Policy Act actually provides new tools to evaluate the environmental effects of each public decision. It permits the adoption of a balanced outlook on environmental problems. Conservation and development are not mutually exclusive. Development of the earth's resources is the tool with which the goal of conservation is achieved. There is no irreconcilable gulf between a sound ecology and a sound economy. There is enough water to serve future needs, if is used and reused well. Consequently, the development of resources must never stop. (Strachan-Chicago)
W72-08973

LEGAL AND POLICY ASPECTS OF GEOTHERMAL RESOURCE DEVELOPMENT,
Duncan, Allen and Mitchell, Washington, D.C.
D. R. Allen.
Water Resources Bulletin, Paper 72022 Vol. 8, No. 2, p 250-256, April 1972. 17 ref.

Descriptors: *Geothermal studies, *Legal aspects, *Water law, *Water resources development, Heat, Electric power, Thermal water.
Identifiers: *Policy making, Energy reservoirs.

Deep within the earth are immense reservoirs of energy in the form of heat - commonly referred to as geothermal resources. Unfortunately, most of these resources are at such depths that it is unlikely they will be recoverable in the forseeable future. Nevertheless, the lure of seemingly inexhaustible amounts of relatively 'clean' energy continues to fascinate man. In certain limited situations man already has been able to tap these reservoirs and harness the energy to his own uses. More of this activity can be expected. While geothermal energy will chiefly be used to produce electric power, persons responsible for water resources management must concern themselves with geothermal resources for water, and water law concepts will continue to play an important role in the development of this resource. (Strachan-Chicago)
W72-08976

LEGAL PROBLEMS OF COAL MINE RECLAMATION,
Maryland Univ., Baltimore. School of Law.
E. F. Goldberg, and G. Power.
Copy available from GPO Sup Doc, $2.00; microfiche from NTIS as PB-209 862, $0.95. Environmental Protection Agency Water Pollution Control Research Series, March 1972, 236 p, 10 tab, 345 ref. EPA Program 14010 F2V 03/72.

Descriptors: *Coal mine wastes, *Reclamation, *Legal aspects, Acid mine waters, Land subsidence, Sediments, Strip mines, Underground, Mining, Administrative decisions, Eminent domain, Interstate compacts, Judicial decisions, Permits, Riparian rights, Third party effects, Water law, Water rights.
Identifiers: *Maryland, *Ohio, *Pennsylvania, *West Virginia.

Coal mining produces a variety of environmental problems--acid drainage, sedimentation, surface subsidence and surface scars. This study reviews the response of legal institutions to these problems in Maryland, Ohio, Pennsylvania and West Virginia. Technological and economic concerns are also taken into account. The study discusses the antecedents of today's Appalachian coal industry and the environmental problems it has created. It examines the way in which the property system allocates rights in coal and coal lands, the efficacy of litigation and present laws and regulations for preventing environmental damage, and constitutional limitations on the ability of states to effectively respond to the problems. A case study of the economics of the Maryland coal industry is also presented. Model legislation giving the states the necessary powers to respond to environmental problems, is proposed. (EPA abstract)
W72-08985

INTERNATIONAL ENVIRONMENTAL DAMAGE CONTROL: SOME PROPOSALS FOR THE SECOND BEST OF ALL POSSIBLE WORLDS,
Kentucky Univ., Lexington. School of Law.
For primary bibliographic entry see Field 06G.
W72-09030

THE POLLUTION PROBLEM AND LEGAL INSTITUTIONS: A CONCEPTUAL OVERVIEW,
California Univ., Los Angeles. School of Law.
For primary bibliographic entry see Field 05G.
W72-09031

STATE EX REL. CHAIN O'LAKES PROTECTIVE ASS'N. V. MOSES (DIVERSION OF LAKE WATERS).

193 N.W.2d 708-711 (Wis. 1972).

Descriptors: *Wisconsin, *Riparian rights, *Reasonable use, *Adjacent land owners, *Common law, Legislation, Navigable waters, Water supply, Judicial decisions, Legal aspects, Water rights, Diversion, Relative rights, Riparian waters, Water utilization, Permits, Administration, Water permits, Alteration of flow, Lakes.
Identifiers: Public trust doctrine.

Plaintiff riparian owners sought to compel defendant to obtain a state permit to divert water from a lake for use in a veterans' home. A statute provided that it is unlawful to divert water to alter the level of any navigable lake or stream, or for agricultural or irrigation purposes without a permit. Plaintiffs contended this statute should be read as prohibiting all diversions of water while defendants argued for strict construction of the statute. In finding for the defendant the court affirmed the lower court ruling. The common law rule was that every riparian owner had an equal right to the use of a lake for all reasonable purposes. What constituted a reasonable use is a question of fact and subject to a trust doctrine which regards all natural resources as impressed with a trust for usage and conservation as a state resource. Since the statute was in derogation of the common law, its application was limited to the enumerated circumstances. Consequently the defendant riparian owner could utilize lake water as a water source for its veterans' home, providing such use was reasonable. (Ilkson-Florida)
W72-09036

THE CLEAN WATER PACKAGE OF AMENDMENTS TO H.R. 11896,
Congress, Washington, D. C.; and House, Washington, D. C.
H. S. Reuss.
Congressional Record, Vol. 118, No. 44, H2399-2400 (daily ed.) March 22, 1972.

Descriptors: *Federal Water Pollution Control Act, *Political aspects, *Regulation, *Water pollution control, Pollution abatement, Legislation, Law enforcement, Water quality standards, Governmental interrelations, Federal government, State governments, Standards, Water pollution, Water pollution sources, Penalties (Legal).

The House version of the 1972 Federal Water Pollution Control Act Amendments shifts the emphasis from the water quality standards approach which after seven years has proven unsuccessful. The new antipollution effort emphasizes instead a program of effluent limitations designed to control water pollution at the source. While Representative Reuss supports this basic approach toward pollution control, he objects to various weaknesses in the House bill and recommends the following changes to the Amendment. First polluters must use the best available technology to reach the national goal of zero discharge by 1981 without further Congressional action. Second, contrary to the present bill, polluters who file for a permit will not be immune from prosecution until 1976. Third, language restricting the rights of persons to sue both polluters and the EPA in order to enforce water pollution control will be removed. Fourth, criminal sanctions against polluters who willfully violate EPA orders are established. Finally, the Amendment will provide more national control over state discharge permit programs in order to prevent economic hardship and interstate competition for industries. (Horwitz-Florida)
W72-09037

MCKIE LIGHTER COMPANY V. CITY OF BOSTON (DUTY TO OPEN AND REPAIR SWING BRIDGE BARRING ACCESS TO NAVIGABLE WATERS).
335 F. Supp. 663-667 (D. Mass. 1971).

Descriptors: *Judicial decisions, *Navigable rivers, *Bridges, *United States, Coast Guard Regulations, Navigation, Legal aspects, Equity, Local governments, Risks, Public rights, Relative rights, Navigable waters, Public access.
Identifiers: *Injunctions (Mandatory).

Plaintiff tugowner sought to require defendant city to regularly open its swing bridge over navigable waters so that plaintiff's tug could reach its berth. A truck had struck and severly damaged the bridge. Temporary repairs were made but when the bridge opened there was substantial risk that it would not close again. This would have resulted in serious inconvenience to public vehicular and pedestrian traffic. Defendant had made arrangements for permanent repairs but the failure to open the swing bridge led to loss of business for plaintiff. The United States district court found jurisdiction in a statute providing that bridges shall not at any time unreasonably obstruct the free navigation of the waters over which they are constructured. The court held that defendant had not obstructed navigation unreasonably because defendant had diligently inspected the bridge and planned permanent repairs. Even if defendant had been unreasonably slow in some intermediate stage, the breach of duty was not continuing and injunctive relief was ruled inappropriate. Plaintiff's compaint was dismissed. (Nielsen-Florida)
W72-09038

AMERICAN WATERWAYS, INC. V. ASKEW (STATE POLLUTION CONTROL LEGISLATION AS AN INFRINGEMENT ON MARITIME UNIFORMITY).

335 F. Supp. 1241-1251 (M.D. Fla. 1971).

Descriptors: *Oil spills, *Constitutional law, *Federal jurisdiction, *State jurisdiction, *Water pollution control, Law of the sea, Ships, Penalties (Legal), Water pollution sources, Navigation, Navigable waters, Legal aspects, Judicial decisions, Regulation, Governmental interrelations, Legislation, Water quality, Oil pollution, Water pollution, Administration, Harbors, Florida, Negligence, United States.
Identifiers: *Water Quality Improvement Act of 1970, *Florida Oil Spill Prevention and Pollution Control Act.

Plaintiffs and intervenors, merchant shippers, challenged the constitutional validity of the Florida Oil Spill Prevention and Pollution Control Act. The Act imposed unlimited liability without fault on vessels discharging oil or other pollutants while destined for or leaving Florida ports. The Act further required payment of cleanup costs, evidence of financial responsibility, and maintenance of pollution containment equipment. Plaintiffs contended that: (1) Florida had legislated maritime law, a subject exclusively within the federal domain; (2) maritime jurisdiction covered all waters used in interstate and foreign commerce; and (3) Congress had enacted the Water Quality Improvement Act of 1970 to remedy the problems contemplated by the Florida Act. Defendants argued that the Florida Act filled a gap in the Federal Act. Denying defendants' contention that it could legislate to protect state waters, the

United States District Court for the Middle District of Florida held that substantive maritime law was exclusively within federal jurisdiction and that the Florida Law was, therefore, unconstitutional. The court stated that the Federal Act provided evidence that Florida's Act was an attempt to change substantive maritime law. It is well settled that state legislation is invalid where it is contravention with general admiralty rules or congressional enactments in the maritime field. (Ilkson-Florida)
W72-09039

THANKS TO CONGRESS, MANY FIRMS FINANACE POLLUTION CONTROL WITH TAX-EXEMPT BONDS,
W. Wong.
Wall Street Journal, at 32, Col. 1, March 1, 1972.

Descriptors: *Bond issues, *Financing, *Treatment facilities, *Pollution control, Costs, Taxes, Cost repayment, Deferred costs, Depreciation, Expenditures, Interest, Interest rates, Rent, Facilities, Water pollution control, Industrial wastes, Industrial production.

Through the sale of tax-exempt industrial-development revenue bonds, which are sold through public agencies and are placed privately or purchased by the public, companies are buying and installing pollution-control facilities at lower costs than they would incur if they used conventional private financing arrangements, such as bank borrowing. The bonds are issued for the company by a local or state authority. Proceeds pay for the control equipment which the company leases by paying a yearly rental fee until the land matures. The company can then buy the equipment at a depreciated price. Interest yielded on the bonds is exempt from income taxes. Usually, the savings in interest costs amount to one or two percentage points less than commercial financing. Other advantages to the companies include faster completion time, reduction of more expensive long-term debenture offerings, and other uses for large amounts of money which otherwise would have gone for pollution control. Use of tax-exempt bonds attracts sources of financing, such as insurance companies and banks, that traditionally invest in tax exempt offerings. (Nielsen-Florida)
W72-09045

SEABED: THE BIG QUESTIONS (SYMPOSIUM DISCUSSION).
War/Peace Report, Vol. 9, p 3-9, October 1969. 1 illus, 2 dwg.

Descriptors: *International law, *Law of the sea, *Exploitation, *Beds under water, *Ownership of beds, Boundary disputes, Continental slope, Continental shelf, Structural geology, Oceans, Organizations, Administrative agencies, International waters, Resources, Water resources, Oil, Mineralogy, United Nations, Military aspects, Beds.
Identifiers: *Seabed.

The resources of the seabed in terms of both petroleum and minerals are immense. However, such resources do not have an economic value unless they can be exploited commercially, and the unknown factor is the cost of exploitation. Discussion of exploitation leads into the question of seabed ownership. Whether the base or the edge of the continental slope is the proper national boundary is debated. How areas beyond such boundaries should be treated is also discussed. It was generally agreed that fixed royalties and regulations should be levied on exploiters and that some equitable distribution of profits should be accomplished. An international regime is needed. Dr. Hollis Hedberg, Ambassador Arvid Pravo, and Senator Claiborne Pell participated in the discussion which related to the value, boundaries, title, and management of the seabed. (Nielsen-Florida)
W72-09046

COMING GOVERNMENT MOVES IN WAR AGAINST POLLUTION (INTERVIEW WITH WILLIAM D. RUCKELSHAUS, ADMINISTRATOR, ENVIRONMENTAL PROTECTION AGENCY).

U.S. News and World Report, Vol. 70, p 70-75, March 29, 1971. 1 illus, 4 photo.

Descriptors: *Federal government, *Water pollution control, *Financing, *Pollution abatement, Air pollution, Administrative agencies, Thermal pollution, Pesticide residues, Wastes, Water pollution treatment, Legislation, Highways, Utilities, Adoption of practices, Water quality, Water quality control, Industrial wastes.

The two major pollution problems involve air and water. There is a much better chance of making real progress in the near future in water pollution control than there is in air pollution control. A two-pronged approach is planned to control water pollution. First, each industrial plant that is not on a municipal waste-treatment system will have to secure, through proper state and federal agencies, a federal discharge permit. Permits will only be issued if effluents meet water quality standards. Second, a plan is proposed to enable municipal sewage-disposal systems to meet established water quality standards. Passage of a new water bill is essential if municipalities and states are to be given the help needed to enable them to clean up their waters. More time is needed before air pollution can be brought under control. Recycling is a feasible solution to the problem of solid waste disposal. DDT and other pesticides may not pose an imminent hazard to public health. (Waldron-Florida)
W72-09047

ENVIRONMENTAL PROTECTION--THE CONSERVATION COMMISSION APPROACH,
Massachusetts Univ., Amherst. Dept. of Government.
D. A. Booth, and P. J. Herbert.
State Government, Vol. 44, p 178-184, 1971.

Descriptors: *Massachusetts, *Conservation, *Protection, *Future planning (Projected), Legislation, Cities, State jurisdiction, Financing, Adoption of practices, Administration, Soil conservation, Water conservation, Planning, City planning, Area redevelopment, Governments.

Conservation commissions are a little known approach to environmental quality control. Developed in Massachusetts in 1957 and operated as municipal commissions, they are authorized by state law to acquire and preserve open lands, protect natural resources, and initiate advanced and coordinated planning. A second conservation aid was the Massachusetts 'Self-Help' Act which aids commissions to purchase conservation land. The act provides for reimbursment with state funds for up to 50% of the purchase price of such land (or development of recreational facilities). Four discrete commission functions are contemplated: acquisition, coordination, planning, and protection. Under the enabling legislation such commissions are authorized to acquire, improve, and otherwise conserve and properly utilize open space and other land and water areas within their city or town. Such commissions also have been an effective means of coordinating environmental activities among various private groups. In addition, the commissions have helped in planning greenbelt areas and protecting open spaces. (Nielsen-Florida)
W72-09048

(FLORIDA ATTORNEY GENERAL'S OPINION ON ANNEXATION OF TERRITORY BEYOND A RIVER),
Florida State Dept. of Legal Affairs, Tallahassee.
R. L. Shevin.
Report 071-245, August 18, 1971. 4 p.

Descriptors: *Florida, *City planning, *Local governments, *Land classification, State governments, Legal aspects, Water law, Judicial decisions, Cities, Urbanization, Jurisdiction, Land tenure, Land use, Real property, Land management.
Identifiers: *Annexation.

The question under consideration involved whether the existence of a river between a municipality and territory proposed to be annexed by the municipality as 'contiguous' territory precluded annexation. The proposed annexation was pursuant to charter authority to annex 'contiguous' territory. Several Florida cases are in accord with the general rule that the intervention of a stream between the corporate boundary and the territory proposed to be annexed does not prevent annexation. However, Florida cases have held that if the body of water or river separating the municipality from the area to be annexed is of such a nature that the territory is not capable of being assimilated into and become a part of a unified central government, the annexation would probably be disapproved. (Nielsen-Florida)
W72-09049

(FLORIDA ATTORNEY GENERAL'S OPINION ON IMPORTING FISH),
Florida State Dept. of Legal Affairs, Tallahassee.
R. L. Shevin.
Report 071-12, January 29, 1971. 4 p.

Descriptors: *Florida, *Fish, *Animal groupings, State governments, Reptiles, Wildlife, Fish conservation, Legal aspects, Administrative agencies, Legislation, Legal review, Fish management, Law enforcement.

The opinion involved an interpretation of the phrase 'any species of the animal kingdom' which appears in a Florida statute relating to the importation of animals. The specific question involved whether such phraseology covers fish and reptiles. The Attorney General concluded that the term does embrace fish. Several sources confirm such an interpretation. Reasoning from the biological precept that basically all living organisms are either plant or animal leads to such a conclusion. Support was also found in several legal and non-legal dictionaries. The Attorney General finally considered other game and fish statutes and concluded that fish legally do belong within the animal kingdom. Section 372.265 provides that it is unlawful to import or release any species of the animal kingdom not indigenous to Florida without first obtaining a permit. (Nielsen-Florida)
W72-09050

(FLORIDA ATTORNEY GENERAL'S OPINION ON FISHING RIGHTS IN NAVIGABLE WATERS),
Florida State Dept. of Legal Affairs, Tallahassee.
R. L. Shevin.
Report 071-168, June 30, 1971. 2 p.

Descriptors: *Florida, *Fishing, *Navigable waters, *Ownership of beds, *Canals, State governments, Bodies of water, Public rights, Legal aspects, Water law, Judicial decisions, Relative rights, Public rights, Fish management.

The opinion, in response to a question concerning fishing rights in navigable waters, dealt with whether the owner of lands beneath an artificially created canal extending from a navigable body of water can keep the public from fishing thereon. In ruling that such an owner could control fishing rights, the Attorney General relied on Clement v. Watson, 58 So. 25 (Fla. 1912). The only exception to this rule is that such control is subject to law. Where sufficient public purpose is found by the legislature, the owner's control could be regulated or abrogated. (Nielsen-Florida)
W72-09051

LEGAL ASPECTS OF WATER POLLUTION IN NEW ENGLAND: A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05G.
W72-09094

6F. Nonstructural Alternatives

ROLE OF ECONOMICS IN PLANNING FLOOD PLAIN USE,
Georgia Inst. of Tech., Atlanta.
L. D. James.
Preprint, American Society of Civil Engineers Annual National Environmental Engineering Meeting, St. Louis, Mo, Oct 1971. 21 p, 2 fig, 8 tab, 7 ref.

Descriptors: *Flood plains, *Flood control, *Optimum development plans, Project planning, Flood plain zoning, Flood protection, Planning, Economics, Benefit-cost analysis, Flood damage, Costs, Land development, Computer programs.
Identifiers: *Flood plain studies, *Flood plain regulator.

The official flood control policy in the U S has recently been redefined. Management of flood plain land use and methods of flood proofing have joined structural measures as alternatives for use in developing a unified program for managing flood losses. Combining structural and nonstructural measures does not eliminate the need for using benefit-cost criteria in choosing alternative unified program designs. The decision to permit development in a flood plain or to use structural measures for protection should consider pertinent economic criteria. The methodology for estimating an optimum nonstructural flood control program is illustrated for a hypothetical situation. Agricultural benefits, residual damages, and other factors contribute to the complexity of computations and have been incorporated into a computer program. Economic criteria, long used in planning structural flood control measures, can and should also be used for planning nonstructural measures. (USBR)
W72-08746

6G. Ecologic Impact of Water Development

ENVIRONMENTAL GEOMORPHOLOGY.
For primary bibliographic entry see Field 04C.
W72-08510

CONSERVATION AND WATER-RESOURCE DEVELOPMENT,
Conservation Foundation, Washington, D.C.
A. A. Davis.
Journal American Water Works Association, Vol 63, No 12, p 789-791, December 1971. 2 photo.

Descriptors: *Conservation, *Water resources development, *Environmental effects, *Planning, *Decision making, Economics, Quality control, Data collections, Technology, Waste disposal, City planning.
Identifiers: *Policy making, *Environmental limits, Citizen participation.

It is unfortunate and inaccurate to view the development and conservation of water resources as antithetical. Tough, legitimate questions must be faced, however, which attack the questions of how much and what kind of growth is needed; when and where growth shall occur; and who shall benefit and who shall pay. At present, land - and water - development decisions are based more on economic impact than on social or environmental consequences. Conservationists are saying that significant environmental damage can no longer be considered an acceptable consequence of economic growth. Lack of adequate data is a major stumbling block in reconciling the interests of the conservationist and the developer. Frequently there is not enough information about the full consequences of certain environmental manipulation. Furthermore, there is no total knowledge of the effects of most of the pollutants released into the air and water. A few guesses can be made about the future. Metropolitan regions seem headed toward high density. To meet resource requirements and to handle waste disposal, vast amounts of water will have to be transported far greater distances than now. The limits of the environment will have to be respected. New technology will be needed to accommodate these developments. The citizen will have to be taken into confidence much more than the custom has been. (Strachan-Chicago)
W72-08536

THE ECOSYSTEM VIEW OF HUMAN SOCIETY,
F. F. Darling, and R. F. Dasmann.
Impact of Science on Society, Vol 19, No 2, p 109-121, 1969. 2 fig, 2 ref.

Descriptors: *Ecosystems, *Ecology, *Planning, Environment, Urbanization, Community.
Identifiers: *Human society, Interaction, Parallels, 'Ecological niche'.

An ecosystem is defined as a community including not only the plants of which it is composed, but the animals habitually associated with them, and the physical and chemical components of the immediate environment or habitat in which the community exists. Together these form a self-contained entity with definable boundaries. The dynamic interchanges between the myriad elements of human society and the parallels in the intricate interactions and equilibria between plant species, animal species, and environment are examined. Human society and nature make up a single ecosystem. Therefore, all human activities must be appraised and managed in the light of their effects on all the other components of the ecosystem. Among the topics discussed are: (1) the 'ecological niche' in nature and society, (2) urban system, and (3) the ecological approach. Planning must be grounded in ecological concerns. (Strachan-Chicago)
W72-08537

INSTITUTIONAL ARRANGEMENTS FOR INTERNATIONAL ENVIRONMENTAL COOPERATION.
National Academy of Sciences, Washington, D.C. Environ Mental Studies Board.
For primary bibliographic entry see Field 06E.
W72-08540

AIRPORT IN THE LAKE,
R. D. Harza.
Limos, Vol 1, No 1, p 13-20, Spring 1968. 3 fig.

Descriptors: *Airports, *Lake Michigan, *Ecology, *Environmental effects, *Planning, *Research and development, Employment opportunities, Recreation, Economics, Water quality, Illinois.
Identifiers: *Chicago (Ill), Multi-discriplines, Noise pollution, Ground traffic.

Controversial aspects are discussed of the proposed airport in Lake Michigan suggested by the City of Chicago. Three basic assumptions are contained in the discussion. (1) Chicago needs a third major airport. (2) Any major civic project of the great magnitude of a modern airport will inevitably have some environmental and ecological impacts. (3) There is a possibility of creating beneficial people-serving public works projects in Lake Michigan. In considering the environmental impact of this proposed airport on the Chicago area, five points are discussed: noise, employment, recreation, area economic development, and ground traffic and access. The ecological impact of the airport falls into two categories: effect on water quality, and effect on aquatic organisms. The proposal is still in the planning stages. Further steps will include: study of the various alignments and modes of access systems; the initiation of a series of detailed studies of the ecological and environmental effects that the airport will have; the development of more detailed planning for the access, passenger-handling, and aviation facilities at the airport; and further engineering studies covering the design and construction of the major marine structures themselves. Some multi-disciplinary planning agency or organization may be developed to insure the most effective integration of all considerations involved. The benefits offered by a Lake Michigan setting offer a unique opportunity to have the most beautiful, efficient, quiet, and useful airport in any major American city. The airport will be compatible with protection and enhancement of the ecology of the Chicago area. (See also W72-08542) (Strachan-Chicago)
W72-08541

ANOTHER VIEW OF THE LAKE AIRPORT,
F. Blum.
Limos, Vol 3, No 3, p 21-27, Fall 1970. 1 fig.

Descriptors: *Airports, *Lake Michigan, *Environmental effects, *Ecology, *Planning, Safety, Weather, Conservation, Illinois.
Identifiers: *Chicago (Ill), Accessibility, Rock quarry, Structural hazards, Disruption.

An opposition view to the proposed airport in Lake Michigan is presented. The report by the Harza Engineering Company, entitled, 'A Summary of Engineering Studies for a Lake Michigan Airport Site' concludes that an airport located in the lake is technically feasible. This report is criticized, issues discussed are accessibility, ecology, rock quarry in the lake, air safety and weather conditions, structural hazards, and disruptions of lakefront and adjacent communities. It can be demonstrated that an airport close to the Chicago Loop area is not the most accessible area to the preponderance of Chicago area air passengers. It is clear that the City has no intention of generating any ecological studies prior to the approval of the airport located in the lake. The effects of special weather conditions on an airport located on a body of water can produce serious safety problems. The proposed polder-dike construction has not been proven to be completely safe. The proposed airport will generate a massive complex of related facilities which could virtually devastate the lakefront and adjacent communities. (See also W72-08541) (Strachan-Chicago)
W72-08542

INTERNATIONAL ASPECTS OF MAN'S EFFECT UPON ENVIRONMENT,
National Academy of Sciences, Washington, D.C.
R. Revelle.
Available from the National Technical Information Service as PB-203 379, $3.00 in paper copy, $0.95 in microfiche. Summary Report of the Ad Hoc Committee of the National Academy of Sciences on Environmental Aspects of Foreign Assistance Programs, January, 1970. 14 p. AID/csd-1122.

Descriptors: *Population, Pollutants, *Environmental effects, Diseases, *Water pollution control, Foreign countries, *Foreign projects, *Foreign research.
Identifiers: *Less developed countries.

A very broad range of man's activities can adversely affect his environment. Among these are land alteration projects which are one of the principal activities of the Agency for International Development (AID) under its capital assistance programs. A second class of problems has arisen from the introduction of pollutants into the environment by man, either deliberately or as a side consequence of industrial and agricultural activities. Also, unprecedented population growth and the technological revolution have brought about a large-scale

migration from farm to urban areas in many less developed countries. This rapid urbanization has almost overwhelmed the sewage, water supply and transportation systems, and the housing capacities of the cities in these countries. As a result of these environmental problems AID should give priority attention to several areas. A thorough review needs to be made of the environmental effects of pesticides and other biocides under conditions in which they will be used in the developing countries. The environmental interactions of engineering projects like dams need to receive detailed evaluations, and greater research efforts need to be made toward finding cures for 'environmental' diseases like schistosomiasis. Also, the environmental consequences of urban-rural displacement should receive greater attention. (Settle-Wisconsin)
W72-08600

HIDDEN LAKE, FRESNO RIVER BASIN, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District. Sacramento, Calif.
For primary bibliographic entry see Field 08D.
W72-08629

FULL SCALE TESTING OF THE HIGH SEAS OIL CONTAINMENT BARRIER (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-08630

HOLLOW CREEK WATERSHED PROJECT, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-08631

TEKAMAH-MUD CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C. Watershed Planning Div.
For primary bibliographic entry see Field 04D.
W72-08632

SPRING CREEK CHANNEL IMPROVEMENT, LOCAL FLOOD PROTECTION PROJECT, SPRINGDALE, ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W72-08633

VIRGINIA BEACH, VIRGINIA--BEACH EROSION CONTROL AND HURRICANE PROTECTION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 08A.
W72-08634

MIAMI HARBOR, FLORIDA-NAVIGATION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 04A.
W72-08635

CORNUDAS, NORTH AND CULP DRAWS WATERSHED, TEXAS, AND NEW MEXICO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-08636

RED LICK CREEK WATERSHED, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-08637

MATAGORDA SHIP CHANNEL, TEXAS--MAINTENANCE DREDGING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 04A.
W72-08638

NEW HOPE LAKE, NORTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 08D.
W72-08639

STARKWEATHER WATERSHED, NORTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-08640

COTTONWOOD CREEK DAM, IDAHO, PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 08D.
W72-08665

WATERLOO, IOWA, LOCAL PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 08A.
W72-08666

TYRONE, BLAIR COUNTY, PENNSYLVANIA--LOCAL FLOOD PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W72-08667

CORPUS CHRISTI SHIP CHANNEL, PORT ARANSAS BREAKWATER, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 04A.
W72-08668

NAVIGATION PROJECT, CATSKILL CREEK, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 04A.
W72-08669

EAST FORK LAKE, EAST FORK MIAMI RIVER, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 08A.
W72-08670

BLUE EYE CREEK WATERSHED PROJECT, ALABAMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-08671

LOS ESTEROS RESERVOIR, SANTA ROSA, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Albuquerque, New Mex.
For primary bibliographic entry see Field 08D.
W72-08672

SMALL FLOOD PROTECTION PROJECT ON MILL CREEK, KENTUCKY, OHIO RIVER BASIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 04A.
W72-08673

1971 PROGRAM OF THE GREAT LAKES RESEARCH CENTER.
Lake Survey Center, Detroit, Mich.
For primary bibliographic entry see Field 02H.
W72-08717

SHIP CANALS AND AQUATIC ECOSYSTEMS,
National Marine Fisheries Service, Washington, D.C.
I. W. Aron, and H. S. Smith.
Science Wash. Vol 174, No 4004, p 13-30. 1971.
Identifiers: Aquatic life, *Ecosystems, *Ship canals, Sea level canals.

Equilibrium has not been achieved since the Erie, Well and the Suez canals were built. These examples serve as a backdrop to speculations about the biological implications of the proposed sea level canal in Central America.--Copyright 1972, Biological Abstracts, Inc.
W72-08780

BUFFALO CREEK AT MEADOW GROVE, NEBRASKA-LOUP RIVER FLOOD CONTROL PROJECT, COLUMBUS, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Neb.
For primary bibliographic entry see Field 04A.
W72-08827

FLOOD CONTROL PROJECT, RONDOUT CREEK AND WALLKILL RIVER, NEW YORK AND NEW JERSEY; (SOUTH ELLENVILLE, N.Y.) RONDOUT CREEK BASIN, AND SANDBURG CREEK, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 08A.
W72-08828

SNAGGING AND CLEARING PROJECT, PAINT CREEK AT PAX, WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT),
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 04A.
W72-08829

PAPILLION CREEK AND TRIBUTARIES, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 08A.
W72-08831

BUFFALO CREEK AT MEADOW GROVE, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 04A.
W72-08836

A TOUGHER DRIVE TO CLEAN UP AIR, WATER.
For primary bibliographic entry see Field 05G.
W72-08840

BRISTOL HARBOR BREAKWATER, BRISTOL HARBOR, RHODE ISLAND (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 08A.
W72-08843

YELLOW CREEK PORT PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Chattanooga.
For primary bibliographic entry see Field 04A.
W72-08845

HEADWATERS-YELLOW RIVER PROJECT MEASURE, GWINNETT COUNTY RESOURCE CONSERVATION AND DEVELOPMENT PROJECT, GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Lawrenceville, Ga.
For primary bibliographic entry see Field 04D.
W72-08846

PROPOSED PRINCIPLES AND STANDARDS FOR PLANNING WATER AND LAND RESOURCES (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Water Resources Council, Washington, D.C.

Available from the National Technical Information Service as PB-205 224D, $3.00 in paper copy, $0.95 in microfiche. December 21, 1971. 17 p.

Descriptors: *Environmental effects, *Water resources development, *Standards, *Water policy, Planning, Project planning, Long-term planning, Decision making, Estimated benefits, Economic justification, Institutions, River basin development, Regional analysis, Social aspects, Water quality, Evaluation, Assessments.
Identifiers: *Environmental impact statements, *National Environmental Policy Act.

The proposed principles and standards are to be established for planning the use of water and land resources of the United States through plans which would be directed to improvement of the quality of life. Objectives of the plans include enhancement of national economic development, environmental quality, and regional development. Beneficial and adverse effects would be displayed for each alternative plan, objective, and social factor. A system of accounts would be established to compare the effects of each plan on various objectives. Actual planning processes are outlined. Cost allocation, reimbursement, and application of the discount rate are dealt with. The principles and standards herein set forth would govern all federal participation in water and land resource programs. The evaluation process would assess beneficial and adverse effects of alternative plans with respect to each objective and would fully conform to the National Environmental Policy Act of 1969. The process of formulating plans and applying the proposed principles and standards is detailed. (Grant-Florida)
W72-08847

CHOPTANK RIVER, CAROLINE COUNTY, MARYLAND (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer, District, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W72-08849

MT. ELBART PUMPED-STORAGE POWERPLANT FRYING PAN-ARKANSAS PROJECT, COLORADO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 08C.
W72-08850

CLIFTY CREEK LAKE, CLIFTY CREEK, WABASH RIVER BASIN, INDIANA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 08D.
W72-08852

MISSISSIPPI RIVER, EAST BANK, WARREN TO WILKINSON COUNTIES, MISSISSIPPI, VICKSBURG- YAZOO AREAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 04A.
W72-08853

THE VITALITY OF THE NAVIGABILITY CRITERION IN THE ERA OF ENVIRONMENTALISM,
For primary bibliographic entry see Field 06E.
W72-08854

ENVIRONMENTAL QUALITY AND WATER DEVELOPMENT,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 06B.
W72-08874

THE RIVER NILE ECOLOGICAL SYSTEM: A STUDY TOWARDS AN INTERNATIONAL PROGRAMME,
Cairo Univ., Giza (Egypt). Dept. of Botany.
M. Kassas.
Biological Conservation, Vol. 4, No. 1, p 19-25, October 1971. 1 fig, 19 ref.

Descriptors: *River basins, *Ecosystems, *Arid lands, *Water resources development, *Regional analysis, Geomorphology, Land forming, Land use, Natural resources, Water conservation, Vegetation effects, Erosion, Sedimentation, Planning, Management, International waters, Human populations, Epidemiology.
Identifiers: *Africa, *Nile River, *Desertification, *Artificial balance.

A river comprises a hydrological system which is intensively studied, and an ecological system which is wider in extent and more structurally complex but usually little studied. The basin of the River Nile is about 2.9 million sq km in area and encompasses an enormous ecological region comprising most of central and northeastern Africa. Within this broad region the Nile is not merely a river but also a complex system comprising various water bodies (marshes, swamps, lakes, canals, drains, etc.) and various landforms (highlands, plains, valleys, etc.). The geomorphic record of the Nile Basin is varied and complex. Natural agencies influencing it include geomorphic processes, especially erosion and sedimentation, climatic changes, and tectonic events. Man's influences on the river include barrages, dams and various diversion systems. Future projects will drain swamps, impound more water, dry up upstream rivulets and influence various forms of land use so as to increase the total sum of erosion, overgrazing, and desertification. Man has managed to destroy the natural balance but has invariably failed to replace it by an artificial balance. Epidemics, pests and other diasters may result from ecological imbalances exacerbated by unwisely used modern technology. An outline is presented for a rational program of international management of the river basin. (Casey-Arizona)
W72-08894

SOME ENVIRONMENTAL CONSIDERATIONS IN THE SITING OF NUCLEAR POWER REACTORS ALONG THE CALIFORNIA COAST,
California Univ., Santa Barbara. Dept. of Geography.
P. F. Mason.
Geography, Vol. 56, No. 253, p 335-337, November 1971. 1 fig.

Descriptors: *Nuclear powerplants, *Nuclear reactors, *Nuclear wastes, *Radioactive wastes, *California, Coasts, Geomorphology, Earthquakes, Landslides, Air pollution.
Identifiers: *Population pressures.

One of the acknowledged necessities of the urban-industrial society that has become the landscape-dominant in California is electricity. By 1990 power consumption will be 4 times current levels. This is not only because of rapid population increase but also because of steady increases in per capita consumption of electricity. To meet this ever-increasing demand the California power companies have become committed to nuclear energy as a basis for power generation. A total of 12 nuclear reactors are operative, under construction or planned for siting along the California coast within the next 2 decades. Coastal waters will be used for generator cooling. Under normal operation, radioactive material is slowly released to air and water in amounts considered by the AEC to be below measurable harm to man. If technical failures occur, for one reason or another, the amounts of radioactivity released could be disastrous. Some 80% are situated in either densely populated areas or in rapidly growing regions. Investigation of seismic, geomorphologic and atmospheric environmental factors reveal: (1) 50% are situated on active fault zones; (2) all are situated in areas of major landslide severity; (3) 25% are located in areas now suffering air stagnation and air pollution. (Casey-Arizona)
W72-08896

CLIMATE-ENGINEERING SCHEMES TO MEET A CLIMATIC EMERGENCY,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 03B.
W72-08900

GLOBAL CLIMATE CHANGE AND THE IMPACT OF A MAXIMUM SEA LEVEL ON COASTAL SETTLEMENT,
North Carolina Univ., Chapel Hill. Dept. of Geography.
R. J. Kopec.
Journal of Geography, Vol. 70, No. 1, p 541-550, December 1971. 2 fig, 2 tab, 16 ref.

Descriptors: *Carbon dioxide, *Heating, *Melting, *Floods, Climatic data, Oceans, Polar regions, Heat exchange, Energy budget, *Air pollution effects, Air environment, Environmental effects, Mode of Action, Human populations, Solar radiation.
Identifiers: *Global, *Global heat balance, *Glacial melting, *Global warming.

Many think that a global warming will soon be underway because of the effect of increasing atmospheric carbon dioxide which will serve to imbalance the earth's energy budget by curtailing outgoing infrared radiation. The root causes of the phenomenon are man's activities. This article accepts the premise of warming. By 2050 A.D., most of the world's supplies of fossil fuels will have been burned. Mean global temperature will have risen an estimated 3.5 degrees C to 6.0 degrees C which would be sufficient to melt the polar ice caps. A chain of circumstances will have been set in motion culminating in a net decrease of about 17% of the land surface. The east coast of North and South America would be severely dimished, as would be central Australia, western Europe, much of the Soviet Union, and the 'cradles' of human population, the heavily populated Hwang Ho and Yangtze Kiang valleys in China and the Ganges-Brahmaputra lowlands of India and Pakistan. Assuming a world population of 14.3 billion at that time, extrapolated from current birth rates, population density will grow from 55 to 300 people/sq mi, but in terms of arable land, it will be 2500 people/sq mi. (Casey-Arizona)
W72-08902

THE CASE FOR THE ENVIRONMENT,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
For primary bibliographic entry see Field 06B.
W72-08962

NATURE AND MAN AND WATER,
Congress, Washington, D.C.; and Committee on Public Works (U. S. House).
For primary bibliographic entry see Field 06E.
W72-08973

WALT DISNEY WORLD AND THE ENVIRONMENT: AN ECOLOGICAL CHALLENGE IN CENTRAL FLORIDA,
Walt Disney World, Orlando, Fla.
For primary bibliographic entry see Field 06B.
W72-08979

INTERNATIONAL ENVIRONMENTAL DAMAGE CONTROL: SOME PROPOSALS FOR THE SECOND BEST OF ALL POSSIBLE WORLDS,
Kentucky Univ., Lexington. School of Law.
S. J. Vasek.
Kentucky Law Journal, Vol. 59, p 673-718, 1971. 160 ref.

Descriptors: *International law, *Law of the sea, *International waters, *Governmental interrelations, Legal aspects, Treaties, Water pollution, International commissions, Oil pollution, Radioactivity, Jurisdiction, United Nations, Technology, Priorities, Continental shelf, Environmental effects, Political aspects, Political constraints, Water pollution control.

Recent conventions have produced debate over the type of international regime needed to control pollution. Causes of international pollution, a framework for legal analysis, the effectiveness of the existing international system, and some changes are discussed. Environmental protection is accorded different priorities by underdeveloped nations, who pollute to become industrialized, than by industrial nations, who work to limit pollution. International environmental interrelationships should be recognized and coordinated. Although a nation is sovereign over domestic acts, where such acts cause environmental damage to another state, the polluting nation is deemed responsible. States with lax pollution controls attract industry which uses such laws to derive economic gain. The question in such cases is when does even internal pollution become an international concern. Also analyzed is the consequence of polluting areas res communis or res nulles such as dumping nerve gas on the high seas. Presently, international cooperation is limited in this area to the Limited Test Ban Treaty and the Convention on Prevention of Pollution of the Sea by Oil. An international sovereign respecting international environmental matters such as the International Seabed Authority is considered desirable. (Ilkson-Florida)
W72-09030

LA FARGE LAKE, KICKAPOO RIVER, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District. St. Paul, Minn.
For primary bibliographic entry see Field 04A.
W72-09032

SMALL FLOOD PROTECTION PROJECT, NORTH FORK, NOLIN RIVER HODGENVILLE, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 04A.
W72-09033

THE NAVIGATION PROJECT, BRISTOL MARINA, DELAWARE RIVER, BUCKS COUNTY, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 04A.
W72-09034

CHENA RIVER LAKES FLOOD CONTROL PROJECT, FAIRBANKS, ALASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 08D.
W72-09035

WINTER OROGRAPHIC CLOUD MODIFICATION EXPERIMENT IN THE ROCKY MOUNTAINS OF COLORADO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
National Science Foundation, Washington, D.C.
For primary bibliographic entry see Field 03B.
W72-09040

SAN ANTONIO CHANNEL IMPROVEMENT, SAN ANTONIO RIVER AND TRIBUTARIES, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 08A.
W72-09041

FORT MYERS BEACH CHANNEL, FLORIDA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 04A.
W72-09042

GREAT LAKES CONNECTING CHANNELS--WIDENING AND DEEPENING BENDS IN ST. MARYS RIVER, MICHIGAN--PHASE I (FINAL ENVIRONMENTAL IMPACT STATEMENT).
United States Lake Survey, Detroit, Mich.
For primary bibliographic entry see Field 04A.
W72-09043

GEOTHERMAL LEASING PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 04B.
W72-09044

ENVIRONMENTAL PROTECTION--THE CONSERVATION COMMISSION APPROACH,
Massachusetts Univ., Amherst. Dept. of Government.
For primary bibliographic enury see Field 06E.
W72-09048

IMPORTATION OF LIQUEFIED NATURAL GAS UNDER THE NATURAL GAS ACT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Federal Power Commission, Washington, D.C.
For primary bibliographic entry see Field 08C.
W72-09052

VERMILION HARBOR, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 08A.
W72-09053

RAILROAD CLOSURE STRUCTURE, BEACH CITY LAKE, SUGAR CREEK, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08D.
W72-09054

HOUSTON SHIP CHANNEL, TEXAS-MAINTENANCE DREDGING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 04A.
W72-09055

BROOMFIELD, COLORADO WATER TRANSMISSION LINE, PROJECT WSP CO-08-00-0110, BROOMFIELD, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of Housing and Urban Development, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 08C.
W72-09056

CORTE MADERA CREEK FLOOD CONTROL PROJECT, MARIN COUNTY, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 08A.
W72-09057

TOCKS ISLAND LAKE PROJECT, DELAWARE RIVER, NEW JERSEY, NEW YORK, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 08A.
W72-09058

SPEWRELL BLUFF LAKE, FLINT RIVER, GEORGIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 08A.
W72-09059

07. RESOURCES DATA

7A. Network Design

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES.
Agricultural Research Service, Washington, D.C. Soil and Water Research Div.
For primary bibliographic entry see Field 02B.
W72-08903

THE RELATIVE EFFICIENCY OF THE DENSITY OF RAIN-GAGE NETWORKS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 02B.
W72-08940

7B. Data Acquisition

MONITORING EARTH RESOURCES FROM AIRCRAFT AND SPACECRAFT,
California Univ., Berkeley. Forestry Remote Sensing Lab.
R. N. Colwell, J. D. Lent, D. M. Carneggie, R. R. Thaman, and C. E. Poulton.
Available from GPO, Washington, D. C. 20402 - Price $4.00. National Aeronautics and Space Administration Report NASA SP-275, 1971. 170 p.

Descriptors: *Remote sensing, *Satellites (Artificial), *Aerial photography, Data collections, Surveys, Mapping, Photogrammetry, Instrumentation, Monitoring.
Identifiers: Data requirements.

The need for earth resource surveys and the value of aircraft and spacecraft as the platforms from which to make such surveys are reviewed. Accurate discrimination of some important earth resource features (timbered and agricultural lands;

vegetated and fallow fields) is possible even on individual blackeand-white space photos. Many more earth resource features are identifiable on Infrared Ektachrome space photos (bottomland hardwood stands, pine-hardwood stands, and certain individual crop types). The interval necessary between successive photographic missions must be selected in light of the particular resources being inventoried and the magnitude of change that must be determined. Interpretation of vegetation resources using Infrared Ektachrome film was generally superior to that made using any of the black-and-white films. Operational earth resource surveys should be made by means of a multistage sampling technique that employs spacecraft, aircraft, and ground observations. Cloud cover is likely to be the most serious deterrent to the making of operational resource surveys on photography taken from either aircraft or spacecraft. See W72-08491 thru W72-08499) (Knapp-USGS)
W72-08490

ADDITIVE-COLOR IMAGE ENHANCEMENT--TECHNIQUES AND EQUIPMENT,
California Univ., Berkeley. Forestry Remote Sensing Lab.
J. D. Lent.
In: Monitoring Earth Resources from Aircraft and Spacecraft, National Aeronautics and Space Administration Report NASA SP-275, p 9-14, 1971. 5 fig, 1 ref.

Descriptors: *Remote sensing, *Aerial photography, *Photogrammetry, *Instrumentation, *Photometry, Spectroscopy, Terrain analysis, Mapping, Surveys, Infrared radiation, Data collections, Monitoring.
Identifiers: Color enhancement, Image enhancement.

Image enhancement consists of a number of specialized remote-sensing techniques designed to help extract useful information from multiband images. The purpose of enhancement usually is to increase the total amount of information that is derivable from the raw data and to facilitate the data extraction process. When additive-color image-enhancement techniques are employed, these objectives usually are realized by highlighting subtleties in image tones. Such enhancements can be accomplished by either optical or electronic means. The most common form of additive-color enhancement employs an optical 'combiner' and involves the use of a set of black-and-white multiband images (transparencies) all showing the same scene. Each image is projected by means of a light beam that has a particular hue because a colored filter is placed in its path. These color images are then superimposed on the viewing screen to form a single color image. The colors thus exhibited on the composite image are a function of the image densities on the respective multiband transparencies and the color values of the filters through which the transparencies are projected. Electronically controlled additive-color enhancement systems, although considerably more complex and expensive to develop than optical systems, offer the image analyst greater flexibility in interpreting his data. (See also W72-08490) (Knapp-USGS)
W72-08491

ANALYSIS OF EARTH RESOURCES IN THE PHOENIX, ARIZONA, AREA,
California Univ., Berkeley. Forestry Remote Sensing Lab.
D. M. Carneggie, L. R. Pettinger, and C. M. Hay.
In: Monitoring Earth Resources from Aircraft and Spacecraft, National Aeronautics and Space Administration Report NASA SP-275, p 15-64, 1971. 27 fig, 24 plate, 17 tab, 14 ref.

Descriptors: *Aerial photography, *Satellites (Artificial), *Remote sensing, *Photogrammetry, *Arizona, Mapping, Terrain analysis, Instrumentation, Surveys, Data collections, Crops, Forages.
Identifiers: *Phoenix (Ariz).

Earth resources near Phoenix, Arizona, were studied using Apollo 9 photography and sequential high-altitude photography. The studies include agricultural, range, geologic, hydrologic, and cultural resources. Some crop types were easily discriminated on the basis of their tone values on panchromatic photographs. Multiband and multidate color composite images prepared by optical and electronic systems were compared. In some cases the identification of a crop was facilitated by interpretation of an enhanced image. Acceptable estimates of crop area can be made from the space photographs. Some soil-type boundaries and the effect on crop growth of soil conditions were easily detected in high-altitude photographs. Wildland vegetation resources were also evaluated on the space photographs, placing particular emphasis upon the forage resource. Infrared Ektachrome photographs proved to be the most useful for this purpose, since broad native vegetation types were readily discerned. The prospects for delineating hydrologic units, determining the distribution of snowpack, and monitoring reservoir levels from an interpretation of space photos were investigated, and very encouraging results were obtained. (See also W72-08490) (Knapp-USGS)
W72-08492

ANALYSIS OF AGRICULTURAL RESOURCES IN THE IMPERIAL VALLEY, CALIFORNIA,
California Univ., Berkeley. Forestry Remote Sensing Lab.
R. R. Thaman, and L. W. Senger.
In: Monitoring Earth Resources from Aircraft and Spacecraft, National Aeronautics and Space Administration Report NASA SP-275, p 65-92, 1971. 10 fig, 17 tab, 2 ref, append.

Descriptors: *Aerial photography, *Satellites (Artificial), *Remote sensing, *Photogrammetry, *California, Mapping, Terrain analysis, Instrumentation, Surveys, Data collections, Crops, Forages, Saline soils.
Identifiers: *Imperial Valley (Calif).

Irrigated agricultural lands are readily differentiated from wildland and urban environments on earth orbital photography. An analysis was made of photographs taken by the Apollo 9 astronauts over the Imperial Valley, California, and of supporting high-altitude photography. The primary objective was to determine the feasibility of making broad crop inventories on such photography. Sequential or multidate, high-altitude aerial photography can improve the reliability of crop identifications or inventories. Because tonal and color differences are of primary importance for the identification of crop types, the poorer resolution of satellite photography is probably not a major factor inhibiting its utility for studies of this type. Small-scale photography may also be of great value for studies of crop yields and field conditions resulting from such factors as excessive salinity or pests. Weather conditions over specific target areas can be monitored from both earth and space so that a remote-sensing system aboard a spacecraft can collect data whenever the conditions are optimum. Costly changes in deployment of aircraft can be avoided in this manner and more useful data obtained. (See also W72-08749) (Knapp-USGS)
W72-08493

A PRELIMINARY VEGETATIONAL RESOURCE INVENTORY AND SYMPOLIC--LEGEND SYSTEM FOR THE TUCSON-WILCOX-FORT HUACHUCA TRIANGLE OF ARIZONA,
Oregon State Univ., Corvallis.
C. E. Poulton, B. J. Schrumpf, and E. Garcia-Moya.
In: Monitoring Earth Resources from Aircraft and Spacecraft, National Aeronautics and Space Administration Report NASA SP-275, p 93-109, 1971. 5 fig, 1 tab, 9 append.

Descriptors: *Aerial photography, *Mapping, *Surveys, *Satellites (Artificial), *Remote sensing, Arizona, Terrain analysis, Photogrammetry, Instrumentation, Crops, Forages, Data collections.
Identifiers: *Tucson (Ariz).

Methods for mapping natural vegetation involving the application of cartographic principles and symbolic-legend concepts are reviewed for their applicability to aerial and space photography. The same principles and concepts, and many of the procedures, appropriate to resource inventory and analysis from large-scale aerial photography are applicable when space and small-scale high-altitude photographs are the working material. Multiscale and multiseasonal photography are desirable, or even essential, techniques in developing thorough resource inventories of the type studied. (See also W72-08490) (Knapp-USGS)
W72-08494

EVALUATION OF WILDLAND RESOURCES OF THE NASA BUCKS LAKE TEST SITE,
California Univ., Berkeley. Forestry Remote Sensing Lab.
A. S. Benson.
In: Monitoring Earth Resources from Aircraft and Spacecraft, National Aeronautics and Space Administration Report NASA SP-275, p 111-115, 1971. 3 fig, 8 plate, 6 ref.

Descriptors: *Natural resources, *Land resources, *Aerial photography, *Remote sensing, *Surveys, Water resources development, Mapping, Recreation, Forests, Wildlife, Land use.
Identifiers: *Wildland resources, *Bucks Lake (Calif).

High-altitude photography from an altitude of 60,000 to 75,000 ft. can aid a wildland manager in mapping types of ground cover (vegetation), monitoring changes in the ground cover with sequential coverage, and selecting primary sample units for more detailed study in multistage sampling. Conventional low-altitude photography (from an altitude of 10,000 to 15,000 ft) also can be used for these tasks, but fewer high-altitude photographs are needed to cover the same area. The 100,000-acre NASA Bucks Lake test site on the west side of the Sierra Nevada Mountains of California was studied for 5 years. The site contains a wide variety of wildland resources, including timber, which is the primary factor in the economy of the area; brush, which provides the habitat for wildlife but in some instances might profitably be replaced by timber; forage suitable for grazing; water, which is becoming the most important resource; and recreation areas. Elevations vary from 3600 to 7000 ft, thus providing a number of climatic regimes that are reflected in differing soil and vegetation types. Infrared Ektachrome was best for delineating ground-cover boundaries, although Pan-25A was satisfactory for delineating several cover types. Except for delineating bodies of water, watercourses, and riparian hardwoods, IR-89B proved unsatisfactory for overall ground-cover typing. Sequential photography, if taken over a number of years, will yield valuable information concerning the consequences of vegetation manipulation and the yield of snow. (See also W72-08490) (Knapp-USGS)
W72-08495

A LAND-USE CLASSIFICATION SYSTEM FROM APOLLO 9 PHOTOGRAPHS FOR THE MISSISSIPPI-LOUISIANA AREA,
California Univ., Berkeley. Forestry Remote Sensing Lab.
R. I. Welch, L. R. Pettinger, and E. H. Roberts.
In: Monitoring Earth Resources from Aircraft and Spacecraft, National Aeronautics and Space Administration Report NASA SP-275, p 117-127, 1971. 6 fig, 2 tab.

Descriptors: *Aerial photography, *Satellites (Artificial), *Surveys, *Terrain analysis, *Land use, Mapping, Photogrammetry, Instrumentation, Data collections, Data processing, Mississippi, Louisiana.

A mix of aerial and space photography is far more useful for earth resource surveys than either type alone if three requirements are met: (1) the photography is of the 'multiband' type, (2) the characteristics of each kind of earth resource are set forth in some clear fashion such as a photointerpretation key, and (3) ground data are collected at representative locations throughout the area. The Apollo 9 astronauts obtained excellent multiband photography of the Mississippi-Louisiana area. Shortly thereafter, aerial photos were taken of selected portions of the area, and ground data were gathered. This information was used to enhance the space photography and also to determine the accuracy with which land-use classifications might be made in this area from such photography. On aerial photography, it is possible to identify timber and agricultural crop species, detect plant diseases, estimate timber volumes and crop yields, evaluate range resource conditions, inventory wildlife, delineate vegetation and soil boundaries, and evaluate wildlife habitat. Space photography can identify regional terrain and vegetation patterns, regional weather patterns, condition of watercourses and large bodies of water, regional soil boundaries, regional snow cover, and similar data that would otherwise require thousands of aerial photos. (See also W72-08490) (Knapp-USGS)
W72-08496

MULTISTAGE SAMPLING OF EARTH RESOURCES WITH AERIAL AND SPACE PHOTOGRAPHY,
California Univ., Berkeley. Forestry Remote Sensing Lab.
P. G. Langley.
In: Monitoring Earth Resources from Aircraft and Spacecraft, National Aeronautics and Space Administration Report NASA SP-275, p 129-141, 1971. 11 fig, 1 tab, 5 ref.

Descriptors: *Remote sensing, *Aerial photography, *Surveys, *Mapping, *Forests, Photogrammetry, Satellites (Artificial), Crops, Sampling, Data collections, On-site data collections, Forest management.
Identifiers: Multistage sampling.

Surveying earth resources from orbiting satellites fitted with remote sensors offers the possibility of obtaining national, continental, or even global coverage with standard specifications as to altitude, sensors, and time. In forest sampling, use of space photographs in an inventory requires some form of multistage sample design. The very small scale and relatively low resolution of satellite imagery makes it impractical to correlate the data directly to ground measurements. To increase the efficiency of a multistage resource sample survey using space and aerial photography, it is necessary to translate the remote-sensor data to information that relates to the resources of interest in a particular survey. One way of doing this is to utilize multistage sampling with variable probabilities of selection at every stage. In such a technique, the sampling probabilities are formulated from the additional information made available by the increasing resolution of remote-sensor data at each sample stage. At the last stage, measurements are obtained on the ground. The ground measurements are projected back through the sampling formula to obtain estimates applicable to the entire area of interest. (See also W72-08490) (Knapp-USGS)
W72-08497

THE USE OF SMALL-SCALE AERIAL PHOTOGRAPHY IN A REGIONAL AGRICULTURAL SURVEY,
California Univ., Berkeley. Forestry Remote Sensing Lab.
W. C. Draeger, and A. S. Benson.
In: Monitoring Earth Resources from Aircraft and Spacecraft, National Aeronautics and Space Administration Report NASA SP-275, p 143-149, 1971. 1 fig, 4 tab, 4 ref.

Descriptors: *Aerial photography, *Surveys, *Satellites (Artificial), *Crops, *Arizona, Photogrammetry, Mapping, Data collections, On-site data collections, Wheat, Barley, Crop production, Remote sensing.
Identifiers: *Maricopa County (Ariz).

Maricopa County, Arizona, was the site of extensive NASA-sponsored research designed to investigate the potential usefulness of small-scale aerial and space photography in the inventory and evaluation of agricultural crops. The nature of agricultural cropland makes it especially well suited to such a study. Such land consists of discrete fields, each of which contains a fairly uniform crop that may vary quite rapidly in its phenological characteristics through a seasonal cycle. Information gathered included the category of crop growing in each field, the condition of the crop, the percent of the ground covered by vegetation, crop height, and the direction of rows, if any. The sampling error (standard error of the estimate expressed as a percent of the estimate) for barley was 11% and for wheat was 13%, whereas the figure for both barley and wheat combined was 8%; indicated that a good deal of error resulted from a confusion of the two grain crops. (See also W72-08490) (Knapp-USGS)
W72-08498

SIGNIFICANCE OF THE RESULTS OBTAINED IN RELATION TO USER REQUIREMENTS,
California Univ., Berkeley. Forestry Remote Sensing Lab.
R. N. Colwell.
In: Monitoring Earth Resources from Aircraft and Spacecraft, National Aeronautics and Space Administration Report NASA SP-275, p 151-165, 1971. 3 tab, 7 ref.

Descriptors: *Remote sensing, *Satellites (Artificial), *Aerial photography, Data collections, Surveys, Mapping, Photogrammetry, Instrumentation, Monitoring.
Identifiers: Data requirements.

A few important earth resource features are consistently identifiable, even on individual frames of black-and-white photography taken by the Apollo 9 astronauts. Many more earth resource features are identifiable on the matching frames of Infrared Ektachrome photography. The accuracy with which these features can be identified is improved in some instances through the use of optical or electronic equipment which produces a single color-enhanced image from two or three matching frames of multiband black-and-white photography. There are important user requirements for the various types of information derivable from space photography. Acquisition of much of the additional information that is desired probably can be facilitated in the future through proper use of multiband space photography of the type acquired on the Apollo 9 mission. (See also W72-08490) (Knapp-USGS)
W72-08499

USE OF TIME-LAPSE PHOTOGRAPHY EQUIPMENT FOR HYDROLOGIC STUDIES,
Geological Survey, Menlo Park, Calif.
J. R. Beck.
Geological Survey Open-file Report, September 20, 1971. 10 p, 10 fig.

Descriptors: *Automation, *Photography, *Data collections, *Hydrologic data, Terrain analysis, Geomorphology, Gullies, Beaches, Beach erosion, California.
Identifiers: *Photography (Time-lapse).

Equipment used for recording hydrologic events photographically on a controlled time scale includes a 16-mm motion-picture camera, batteries, and associated intervalometer hardware. Variables that affect operation of the equipment, and which are used to turn the equipment on and off upon demand, are sunlight intensity, rainfall, and time. A 15-minute silent motion picture was made from the time-lapse film installed at Bolinas Lagoon, California. This film shows sand erosion and deposition on the Stinson Beach Spit during the period January 1968 to July 1969. (Knapp-USGS)
W72-08507

RELIABILITY OF SALINITY SENSORS FOR THE MANAGEMENT OF SOIL SALINITY,
Agricultural Research Service, Riverside, Calif. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02G.
W72-08522

FEASIBILITY STUDY OF WATER RESOURCE POLLUTANT IDENTIFICATION BY DIGITAL COMPUTER IDENTIFICATION OF REMOTE INFRARED SENSOR SPECTRAL SIGNATURES,
Clemson Univ., S. C. Dept. of Electrical and Computer Engineering.
For primary bibliographic entry see Field 05A.
W72-08592

AN AUTOMATED SYSTEM FOR MULTIPLE RECORDING OF DIURNAL PH,
Battelle Memorial Inst., Richland, Wash.
E. G. Wolf, C. E. Cushing, and F. W. Rabe.
Limnology and Oceanography Vol 16, No 3, p 577-580. 1971. Illus.
Identifiers: *Automation, Diurnal, *Hydrogen ion concentration, *On-site data collections.

An inexpensive system continuously measures and records pH at 4 locations along a stream. An example of the computer output for productivity and respiration for 1 day is presented.--Copyright 1972, Biological Abstracts, Inc.
W72-08603

A COMPARISON OF GEIGER-MUELLER AND LIQUID SCINTILLATION COUNTING METHODS IN ESTIMATING PRIMARY PRODUCTIVITY,
Manitoba Univ., Winnipeg. Dept. of Zoology.
For primary bibliographic entry see Field 05A.
W72-08604

A PORTABLE FLOW-CELL MEMBRANE SALINOMETER,
Woods Hole Oceanographic Institution, Mass.
T. R. S. Wilson.
Limnology and Oceanography Vol 16, No 3, p 581-586. 1971. Illus.
Identifiers: Construction, Design, *Salinometer, *Salinity, *Laboratory equipment, *Equipment, *On-site data collections.

The design and construction of a portable flow-cell membrane salinometer suitable for field and laboratory use are described. The overall system accuracy is 1% of the salinity value, over the range 1-40%. The instrument is battery-powered and capable of continuously recording temporal and spatial salinity variations.--Copyright 1972, Biological Abstracts, Inc.
W72-08605

A QUANTITATIVE METHOD OF SAMPLING PERIPHYTON FROM ROUGH SUBSTRATES,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Ustav Biologie Kraniny.
M. Ertl.
Limnology and Oceanography Vol 16, No 3, p 576-577. 1971. Illus.
Identifiers: *Periphyton, *Sampling, Substrates.

A sampling device and procedure are described suitable for quantitative collection of both the sessile and mobile components of the periphyton community from substrates with rough and uneven surfaces.--Copyright 1972, Biological Abstracts, Inc.
W72-08607

AN INTERSTITIAL WATER-SAMPLING RECEPTACLE FOR INTERTIDAL MUD FLATS,
Maine Dept. of Sea and Shore Fisheries, West Boothbay Harbor.
E. P. Creaser, Jr.
Journal of the Fisheries Research Board of Canada, Vol 28, No 7, p 1049-1051, 1971, Illus.
Identifiers: *Mud flats, Sampling, *Water sampling, *On-site investigations, *Equipment.

In the apparatus described, a common receptacle may be used in conjunction with a pressure-compensating chamber or a vacuum service unit. The pressure-compensating unit is operable at any stage of the tide and requires from 12 to 24 hr to obtain a sample. The vacuum extract unit is operable on the exposed flat at low tide only and usually requires from 20 to 30 min to obtain a sample.--Copyright 1972, Biological Abstracts, Inc.
W72-08611

A SENSOR FOR DETECTING THE PRESENCE OF A LOBSTER (HOMARUS AMERICANUS) IN A BURROW,
Fisheries Research Board of Canada, Nansimo (British Columbia). Biological Station.
J. C. Scrivener, and L. D. B. Terhune.
Journal of the Fisheries Research Board of Canada, and Vol 28, No 7, p 1062-1063, 1971, Illus.
Identifiers: Burrows, Detection, Homarus americanus, *Lobsters, Sensors, *Equipment.

The design and operation of a lobster sensor switch are described. It is a weight-sensitive device that forms the floor of a lobster's burrow. When connected to an event recorder, a continuous record of the presence of the lobster is obtained.--Copyright 1972, Biological Abstracts, Inc.
W72-08615

SAMPLING BENTHOS AND SUBSTRATE MATERIALS, DOWN TO 50 MICRONS IN SIZE, IN SHALLOW STREAMS,
Fisheries Research Board of Canada, Nansimo (British Columbia). Biological Station.
J. H. Mundie.
Journal of the Fisheries Research Board of Canada, Vol 28, No 6, p 849-860, 1971, Illus.
Identifiers: Benthos, Biology, Fish, Invertebrates, Materials, Microns, *Sampling, Shallow water, Streams, Substrate, *On-site investigations, *Equipment.

Stream bed materials, both biotic and abiotic, in the size range 50 microns-ca. 200 mm can be sampled unselectively, in shallow streams, with a simple inexpensive apparatus consisting of a box provided with an adjustable upstream inlet, and, downstream, two nets, one within the other. Collected materials are wet-sieved and the volumes of inorganic material passed by successively finer sieves are plotted as cumulative curves against a logarithmic size scale. Curves are given for materials from 3 contrasting habitats: a riffle, and pool, of a coastal stream, and an artificial spawning channel. Examples are also given of the densities, size distribution, and vertical stratification of invertebrates from these habitats. Applications of the method to studies on fish biology, invertebrate ecology, and geomorphology are indicated.--Copyright 1972, BiologicalAbstracts, Inc.
W72-08616

METHODS, MODELS AND INSTRUMENTS FOR STUDIES OF AQUATIC POLLUTION. AN ANNOTATED BIBLIOGRAPHY,
Ocean Engineering Information Service, La Jolla, Calif.
For primary bibliographic entry see Field 05A.
W72-08790

IDENTIFICATION OF URBAN WATERSHED UNITS USING REMOTE MULTISPECTRAL SENSING,
Colorado State Univ., Fort Collins. Dept. of Watershed Science.
R. R. Root, and L. D. Miller.
Available from the National Technical Information Service as PB-209 639, $3.00 in paper copy, $0.95 in microfiche. Environmental Resources Center Completion Report No 29, Jan 1972. 133 p, 31 fig, 6 tab, 13 ref, 6 append. OWRR A-012-COLO (1).

Descriptors: *Urbanization, *Watersheds (Basins), *Surface runoff, *Mathematical models, *Computer models, *Hydrologic models, Asphalt, Trees, Pastures, Colorado, *Remote sensing, Aerial photography, Models studies.
Identifiers: Multispectral remote sensing, Multispectral scanner, Automatic image processing, Urban watershed modeling, Optimum wavelength bands, *Urban watersheds, *Denver (Colo).

The dynamic nature of urbanizing watersheds is documented by analysis of thirteen small watersheds in the Denver suburbs for the percent area of ten surface materials using aerial photographs at five to ten year intervals (concrete, asphalt, rooftop, gravel, lawn, natural, agricultural, forested, bare soil, and water). The results clearly show the changes in impervious areas in these watersheds as a function of year and time of year. A method is outlined whereby remote multispectral imagery can be used to map these surface characteristics which in turn can be related to surface hydrologic units and used as input into a watershed simulation model. Spectroreflectance curves were measured for each of the ten surface materials and used in an optimization process to determine how readily they might be mapped by multispectral scanning systems. The procedure uses a sequence of FORTRAN computer programs to determine the optimum wavelength bands to be used in multispectral imaging devices to differentiate the ten surface units via automatic image processing. The results can be used in the design and operation of remote multispectral sensors to identify urban hydrologic units. Complete program listings and flowcharts are included along with air photos and topographic maps of each of the watersheds examined. An extensive bibliography on remote sensing and urban hydrology is also included.
W72-08791

THE USE OF ORBITAL PHOTOGRAPHY FOR EARTH-RESOURCES SATELLITE MISSION PLANNING,
Earth Satellite Corp., Washington, D.C.
F. J. Wobber.
Photogrammetria, Vol 28, No 2, p 35-59, April 1972. 14 fig, 4 tab, 13 ref.

Descriptors: Satellites (Artificial), *Aerial photography, *Remote sensing, Instrumentation, Mapping, Data collections, Terrain analysis.

Demands for scarce natural resources and for protection of the environment have brought increasing attention to the uses of survey satellites in the exploration and management of earth resources. The results of imagery taken from orbital and suborbital altitudes are presented. Earth-orbital photography can be used not only to illustrate potential applications of future ERTS-A satellite imagery but to anticipate how operational factors shuch as resolution, illumination and angle of view can enhance its interpretability. An analysis of the data content of orbital photography and its photogrammetric properties, while primarily useful for defining specifications for the optimum utilization of earth orbital imaging systems, can be used indirectly to pin-point data gaps best filled by other sensors. It is, for example, feasible to examine the extent to which existing orbital images provide useful earth resources data and then to evaluate the extent to which marginally useful images must be supplemented by airborne active and passive sensor systems to effectively fulfill task requirements. A variety of scatterometers, radar images, radiometers, infrared images, and spectrometers, are being considered for earth resources survey applications. Radar and infrared systems promise to have special value for supplementing the scientific data content of orbital images. (Knapp-USGS)
W72-08809

FIELD MEASUREMENTS IN THE DRAINAGE BASIN,
Exeter Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 04A.
W72-08884

REMOTE SENSING IN EVAPOTRANSPIRATION RESEARCH ON THE GREAT PLAINS,
Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02D.
W72-08931

THE ROLE OF GRAVITY IN CAPILLARY PRESSURE MEASUREMENTS,
Calgon Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 02F.
W72-08944

QUANTITATIVE EVALUATION OF WATER QUALITY IN THE COASTAL ZONE BY REMOTE SENSING,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.
W72-08996

SNOW AND ICE MELT AS INDICATORS OF HYDROLOGIC CONDITIONS, EXPLORATORY STUDY,
South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 02F.
W72-08999

EXPENDABLE BATHYTHERMOGRAPH FOR SUBMARINES AND DEVICE FOR LAUNCHING,
Department of the Navy, Washington, D.C. (Assignee).
R. P. Crist.
U. S. Patent No. 3,524,347, 5 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 877, No. 3, p 531, August 18, 1970.

Descriptors: *Patents, *Bathythermographs, *Instrumentation, *Water properties, Water temperature, Depth, Measurement.
Identifiers: *Sensors, Probes.

A sensor probe is launched from a submerged vehicle. A buoyant float device carries the probe to the water surface. At the surface or at a predetermined depth the sensor probe is released and allowed to fall free through the water. The sensor measures specified water properties and transmits the data to the vehicle by means of an electric conductor connected between the sensor and the vehicle. Measurements are correlated with water depth. (Sinha-OEIS)
W72-09026

FIELD TESTS OF PUMPING-TYPE SEDIMENT SAMPLERS,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 02J.
W72-09063

7C. Evaluation, Processing and Publication

MONITORING EARTH RESOURCES FROM AIRCRAFT AND SPACECRAFT,
California Univ., Berkeley. Forestry Remote Sensing Lab.

For primary bibliographic entry see Field 07B.
W72-08490

ADDITIVE-COLOR IMAGE ENHANCEMENT--TECHNIQUES AND EQUIPMENT,
California Univ., Berkeley. Forestry Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W72-08491

ANALYSIS OF EARTH RESOURCES IN THE PHOENIX, ARIZONA, AREA,
California Univ., Berkeley. Forestry Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W72-08492

A PRELIMINARY VEGETATIONAL RESOURCE INVENTORY AND SYMPOLIC--LEGEND SYSTEM FOR THE TUCSON-WILLCOX-FORT HUACHUCA TRIANGLE OF ARIZONA,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 07B.
W72-08494

MULTISTAGE SAMPLING OF EARTH RESOURCES WITH AERIAL AND SPACE PHOTOGRAPHY,
California Univ., Berkeley. Forestry Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W72-08497

THE USE OF SMALL-SCALE AERIAL PHOTOGRAPHY IN A REGIONAL AGRICULTURAL SURVEY,
California Univ., Berkeley. Forestry Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W72-08498

SIGNIFICANCE OF THE RESULTS OBTAINED IN RELATION TO USER REQUIREMENTS,
California Univ., Berkeley. Forestry Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W72-08499

STREAMFLOW RECORDS OF THE SNOWY MOUNTAINS REGION, AUSTRALIA, 1966 TO 1970.

Snowy Mountains Hydro-Electric Authority, Cooma, N.S.W., Australia, July 1971. 279 p.

Descriptors: *Streamflow, *Hydrologic data, *Data collections, *Australia, Gaging stations, Flow measurement, Flow rates, Peak discharge, Low flow, Average flow, Runoff.
Identifiers: *Australia (Snowy Mountains Region).

Streamflow records collected by the Snowy Mountains Hydro-electric Authority in the Snowy Mountains Region, Australia, from January 1966 to December 1970 are presented together with the records of stations transferred from the Authority to the Snowy Mountains Council, the operating body for the Snowy Mountains Scheme, in June 1969. Records are included for the Murrumbidgee, Upper Murray and Snowy River basins with a general introduction, a location map, and charts showing the period of record available. The records for each basin are arranged in alphabetical order, but on the charts the sites are listed in downstream order. The records for each station are presented in three forms: (1) summary which contains geographical data, a history of the station, and a summary of its records for the period available; (2) monthly records of runoff volumes for each month of record and the maximum and minimum instantaneous discharges observed in each month; and (3) records of daily average discharge of each day of record. (Woodard-USGS)
W72-08517

FLOW CHARACTERISTICS OF MINNESOTA STREAMS,
Geological Survey, St. Paul, Minn.
W. B. Mann, IV.
Minnesota Division of Waters, Soils and Minerals Technical Paper No 4, 1971. 265 p, 4 fig, 16 ref.

Descriptors: *Streamflow, *Flow characteristics, *Minnesota, *Hydrologic data, Basic data collections, Reviews, Flow rates, Gaging stations, Flow measurement, Flow duration, Peak discharge, Low flow, Hydrographs, Frequency curves.

Streamflow characteristics are summarized from data collected at 154 gaging stations in Minnesota. The first gaging station was established in 1886. Since that time there has been a gradual expansion to about 125 gaging stations in 1968. The statistical summaries obtained by computer analysis include tables of flow-duration data, highest mean discharge for various periods of time, and lowest mean discharge for similar periods. Hydrographs for selected streams include flow-duration, high-flow frequency, and seven-day low-flow frequency curves. (Woodard-USGS)
W72-08519

SUMMARY OF ANNUAL WAVE POWER FOR TEN DEEP WATER STATIONS ALONG THE CALIFORNIA, OREGON AND WASHINGTON COASTS,
California Univ., Berkeley. Coll. of Engineering.
J. W. Johnson, J. T. Moore, and F. B. Orrett.
Available from NTIS, Springfield, Va. 22151, as AD-733 893. Price $3.00 paper copy; $0.95 microfiche. California University Hydraulic Engineering Laboratory Report HEL 24-9, October 1971. 241 p, 2 fig, 2 tab, 5 ref, 2 append. Army Coastal Engrg. Res. Center-DACW 72-71-C-0005 and DACW 72-67-C-0015.

Descriptors: *Ocean waves, *Coasts, *Beach erosion, *Pacific Coast Region, California, Oregon, Washington, Shores, Shoreline cover, Shore protection, Littoral drift, Sands, Rocks, Hydrologic data, Deep water, Sediment transport.
Identifiers: Wave action, Shoreline shapng.

Wave statistics are presented for ten locations on the California, Oregon and Washington coasts. These deepwater wave statistics were compiled by hindcast procedures using meteorological records and charts from 1956 through 1958. Wave height, direction, and wave period for 'sea' and 'swell' were averaged monthly and annually. While sandy beaches may change as a result of changing wave conditions, rocky shorelines change very little from wave action over hundreds of years. Seasonal variations of wave power were analyzed on a monthly basis, and are graphically presented as wave power vs. period and power vs. direction. (Woodard-USGS)
W72-08520

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR LITTLE POND CREEK AND NORTH ELM CREEK, BRAZOS RIVER BASIN, TEXAS, 1970,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02E.
W72-08524

THE RESPONSE TO TIDAL FLUCTUATIONS OF TWO NON-HOMOGENEOUS COASTAL AQUIFER MODELS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 02F.
W72-08585

FEASIBILITY STUDY OF WATER RESOURCE POLLUTANT IDENTIFICATION BY DIGITAL COMPUTER IDENTIFICATION OF REMOTE INFRARED SENSOR SPECTRAL SIGNATURES,
Clemson Univ., S. C. Dept. of Electrical and Computer Engineering.
For primary bibliographic entry see Field 05A.
W72-08592

COMPUTER SIMULATION OF LARGE SCALE POLLUTANT DISPERSION IN LAKE ERIE,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05B.
W72-08682

PERFORMANCE ANALYSIS OF THE HURRAN TROPICAL CYCLONE FORECAST SYSTEM,
National Weather Service, Miami, Fla.
For primary bibliographic entry see Field 02B.
W72-08730

WATER RESOURCES INVESTIGATIONS IN MARYLAND AND THE DISTRICT OF COLUMBIA, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 4 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Maryland, *District of Columbia, *Inter-agency cooperation, Precipitation (Atmospheric), Low flow, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Sediment transport, On-site investigations, Water temperature, Water quality, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

A summary of the water resources studies and investigations of the U.S. Geological Survey in Maryland and the District of Columbia is presented. A selected bibliography of material concerning the States is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 98 primary, secondary, and water management streamflow stations; 129 groundwater/observation wells; and 27 water quality observing sites. Small State maps show principal sources of groundwater, discharge of the principal rivers, minimum streamflow conditions, and mean annual precipitation. A map, scale 18 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Maryland and the District of Columbia in December 1968. (Woodard-USGS)
W72-08732

WATER RESOURCES INVESTIGATIONS IN NEBRASKA, 1969.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 6 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Nebraska, *Inter-agency cooperation, Precipitation (Atmospheric), Runoff, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Water temperature, Sediment transport, On-site investigations, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

A brief summary is presented of the water resources studies and investigations of the U.S. Geological Survey in Nebraska. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data

network consists of 170 primary, secondary, and water management streamflow stations; 1,164 groundwater observation wells; and 77 water quality observing sites. Small State maps show principal sources of groundwater, average annual precipitation, suspended-sediment concentrations in streams, discharge of the principal rivers, and the dissolved solids in ground and surface waters. A map, scale 48 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Nebraska in April 1969. (Woodard-USGS)
W72-08733

EARTH RESOURCES,
General Electric Co., Philadelphia, Pa. Missile and Space Div.
T. Brewer.
Datamat, Vol 16, No 9, p 25-28, Aug 1970. 1 fig.

Descriptors: *Resources development, *Natural resources, *Data collections, Computers, Satellites (Artificial), Data processing, Air pollution, Water pollution, Ecology, Management, Decision making, Technology, Environment.
Identifiers: *Information systems, Dissemination (Information), Computer-based systems.

Problems under the heading 'Management of the Earth's Resources' will put increased emphasis on the requirements for handling and processing information. New and highly innovative responses will be required. Satellites and other modern data collection systems may be the key to more sensible management of the earth's resources, but their effectiveness depends on massive computer processing. Questioning whether man should or should not modify his environment is useless--he will because he cannot avoid doing so. The problem, and our objective, must be to assure that the results of his actions are foreseen and acceptable to mankind. Some more concerted, large-scale efforts in the earth resources areas are reviewed. Global information can be put to use constructively in 3 broad categories: dealing with emergencies; resource management; and planning and study. The computer becomes a vital tool with which to exercise the mathematical models formulated by environmentalists for analyzing and controlling earth management systems. The scope of this effort is immense, and much cooperation among the diverse intra- and inter-national organizations will be required at the global level. (USBR)
W72-08759

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 7 AND 8. LOWER MISSISSIPPI RIVER BASIN AND WESTERN GULF OF MEXICO BASINS.
Geological Survey, Washington, D.C.

Available from GPO Washington, DC 20402, $3.50. Geological Survey Water-Supply Paper 2014, 1972. 814 p, 1 fig.

Descriptors: *Water quality, *Water analysis, *Surface waters, *Basic data collections, Mississippi River, Mississippi River Basin, Gulf of Mexico, Southeast U.S., Chemical analysis, Analytical techniques, Water temperature, Streamflow, Sediment transport, Sedimentation, Particle size, Hydrologic data.
Identifiers: Lower Mississippi River basin, Western Gulf of Mexico basins, Basic data records.

Quality of water data for the lower Mississippi River basin and western Gulf of Mexico basins are presented for the 1967 water year (October 1, 1966 to September 30, 1967). The Geological Survey maintained 294 sampling stations on 160 streams for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 271 of these locations for chemical-quality studies. Samples were also collected less frequently at many other points. Water temperatures were measured continuously at 16 and daily at 134 stations. Quantities of suspended sediment are reported for 31 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 47 stations. The stream discharges reported in the tables are either daily mean discharges or discharges obtained at the time samples were collected. Discharges reported for composite samples are usually the average of daily mean discharges for the composite period. (Myers-USGS)
W72-08805

THE USE OF ORBITAL PHOTOGRAPHY FOR EARTH-RESOURCES SATELLITE MISSION PLANNING,
Earth Satellite Corp., Washington, D.C.
For primary bibliographic entry see Field 07B.
W72-08809

LANDSCAPE OF NORTHERN GREENLAND,
Geological Survey, Arlington, Va. Military Geology Branch.
For primary bibliographic entry see Field 02C.
W72-08822

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: WALNUT GULCH, ARIZ.,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02B.
W72-08904

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: REYNOLDS CREEK, IDAHO,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 02B.
W72-08907

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: EKALAKA, MONT.
Agricultural Research Service, Sidney, Mont. Northern Plains Soil and Water Research Center.
For primary bibliographic entry see Field 02B.
W72-08910

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: COSHOCTON, OHIO,
North Appalachian Experimental Watershed, Coshocton, Ohio.
For primary bibliographic entry see Field 02B.
W72-08912

AGRICULTURAL RESEARCH SERVICE PRECIPITATION FACILITIES AND RELATED STUDIES: CHICKASHA, OKLA.,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 02B.
W72-08913

EVAPOTRANSPIRATION IN THE GREAT PLAINS.
For primary bibliographic entry see Field 02D.
W72-08920

COMPUTER SIMULATION MODEL OF COASTAL PROCESSES IN EASTERN LAKE MICHIGAN,
Williams Coll., Williamstown, Mass.
For primary bibliographic entry see Field 02H.
W72-08991

WATER RESOURCES INVESTIGATIONS IN ILLINOIS, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1968. 8 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Illinois, *Inter-agency cooperation, Precipitation (Atmospheric), Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, On-site investigations, Water quality, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Illinois are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 173 primary, secondary, and water management streamflow stations; 4 goundwater observation wells; and 7 water quality observing sites. Small State maps show average annual precipitation, discharge of principal rivers, and areas of flood inundation. A map, scale 50 mi to the in., shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Illinois in June 1968. (Woodard-USGS)
W72-08992

WATER RESOURCES INVESTIGATIONS IN INDIANA, 1969.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 4 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Indiana, *Inter-agency cooperation, Precipitation (Atmospheric), Runoff, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Sediment transport, On-site investigations, Water quality, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Indiana are described. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 188 primary, secondary, and water management streamflow stations; 121 groundwater observation wells; and 27 water quality observing sites. Small State maps show principal sources of groundwater, normal annual precipitation, average annual runoff, and discharge of principal rivers. A map, scale 30 mi to the in., shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Indiana in January 1969. (Woodard-USGS)
W72-08993

WATER RESOURCES INVESTIGATIONS IN CALIFORNIA, 1969.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 3 fig, 1 map.

Descriptors: *Water resources, *Investigations, *California, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, On-site investigations, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U. S. Geological Survey in California are sum-

marized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 1,000 primary, secondary, and water management streamflow stations; 1,254 groundwater observation wells; and 249 water quality observing sites. Small State maps show principal sources of saline groundwater, discharge of the principal rivers, and average annual runoff. A map, scale 16 mi to the in., shows by symbols, numbers, and colored outline the hydrologic data network and investigations in California in January 1969. (Woodard-USGS)
W72-08994

WATER RESOURCES INVESTIGATIONS IN CONNECTICUT, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1969. 1 sheet, 5 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Connecticut, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, On-site investigations, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U. S. Geological Survey in Connecticut are described. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 91 primary, secondary, and water management streamflow stations; 21 groundwater observation wells; and 16 water quality observing sites. Small State maps show principal sources of groundwater, average annual precipitation, average annual runoff, and discharge of the principal rivers. A map, scale 9 mi to the in., shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Connecticut in October 1968. (Woodard-USGS)
W72-08995

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS AND ADJOINING AREAS, APRIL 1965 - SEPTEMBER 1969,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 05A.
W72-09000

ANALYSIS OF WATER LEVEL DATA FOR EVERGLADES NATIONAL PARK, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02E.
W72-09001

CHECKS ON THE WATER BALANCE OF A SMALL CATCHMENT,
Hull Univ. (England).
For primary bibliographic entry see Field 02A.
W72-09005

MODELLING TECHNIQUES IN WATER RESOURCES SYSTEMS.
For primary bibliographic entry see Field 06A.
W72-09065

MULTIVARIATE RAINFALL GENERATOR FOR ANNUAL, SEASONAL, MONTHLY, AND DAILY EVENTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-09083

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, LOUISIANA: PHASE I, AREA DESCRIPTION AND PHASE IV, BIOLOGY,
Louisiana Wild Life and Fisheries Commission, New Orleans.
For primary bibliographic entry see Field 02L.
W72-09097

THE FEASIBILITY OF ADP OF AIRBORNE LINE SCAN IMAGERY FOR NEAR SHORE BATHYMETRY,
Development and Resources Transportation Co., Silver Spring, Md.
L. A. LeSchack, and D. E. McIvor.
Available from the National Technical Information Service as AD-734 430, $3.00 in paper copy, $0.95 in microfiche. D and RTCo Technical Report No. 6, November 1971. 21 p, 17 fig, 3 ref. ONR Contract N00014-71-C-0327.

Descriptors: *Beaches, *Bathymetry, *Aerial photography, *Monitoring, Waves (Water), Shores, Wavelengths, Depth, Mapping, Surveys, Equipment, Data processing, Data collections, Equations, Mathematical studies, Sounding, Texas, Correlation analysis, Remote sensing, Coasts, Surf.
Identifiers: *Line-scan imagery, Microdensitometers, Beach profiles, *Galveston (Tex), Errors.

Automatic data processing techniques have been applied to airborne line-scan imagery of coastal areas for the purpose of beach reconnaissance. Preliminary work conducted by the Development and Resources Transportation Company indicates that parallel microdensitometer scans of aerial photographs of a coastal area near Galveston, Texas, where ocean swell is visible, can be cross-correlated, both spatially and temporally, to extract wave length (L) wave angle (phi), and wave speed (C). The information from the microdensitometer scan lines, which simulates standard airborne line-scan imagery apparently can be used to evaluate the wave relationship where C squared equals gL/2pi tanh (2pid/L) in such a way that the values of water depths (d) near shore can be determined. Despite errors and uncertainties associated with the photo simulation process, there was sufficient agreement between computed depths and the charted depths for the same area, with one anomalous exception, to encourage belief that the overall concept is feasible. (Mackan-Battelle)
W72-09098

COMPUTER PROGRAMS FOR USE IN X-RAY SPECTROGRAPHY-DETERMINATION OF TRACE ELEMENTS AND OF DEAD-TIME OF COUNTERS,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
For primary bibliographic entry see Field 05A.
W72-09101

SLOPE ANALYSIS FOR RECOGNITION AND CHARACTERIZATION OF STRONGLY OVERLAPPED CHROMATOGRAPHIC PEAKS,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W72-09116

08. ENGINEERING WORKS

8A. Structures

COVERING OPEN DISTRIBUTION RESERVOIRS,
Kramer, Chin and Mayo, Seattle, Wash.
A. G. Chin.
Journal American Water Works Association, Vol 63, No 12, p 763-768, December 1971. 4 photo, 9 fig.

Descriptors: *Reservoirs, *Reservoir design, *Distribution, *Planning, Public health, Water quality control, Maintenance, Economic feasibility.
Identifiers: *Reservoir covers, *Policy making, Hoquiam College Hill Reservoir Cover Project, Resource utilization.

Problems relating to the covering of existing open distribution reservoirs are discussed. The data presented are the results of studies and surveys conducted over a three-year period in connection with the Hoquiam College Hill Reservoir Cover Project. The basic reasons for covering reservoirs include: (1) to protect public health, (2) to provide better water quality, (3) to reduce maintenance, and (4) to provide better utilization of urban resources. Although there is a general concurrence that existing open distribution reservoirs should be covered, the lack of public policies hinders the resolution of the problem. Since there is no aid program, the burden of recovering falls upon the individual reservoir. A covering of plywood roof deck, timber framing, and concrete columns was selected for the Hoquiam College Hill Reservoir. This cover met all the requirements of: lightweight, quick erection, economic feasibility, and ease of maintenance. (Strachan-Chicago)
W72-08535

SHORE PROTECTION GUIDELINES, A PART OF THE NATIONAL SHORELINE STUDY.
Corps of Engineers, Washington, D.C.

August 1971. 59 p, 37 fig.

Descriptors: *Shore protection, *Shores, *Beaches, *Beach erosion, Lakeshores, Seashores, Artificial beaches, Coastal engineering, Coastal structures, Coasts, Littoral, Littoral drift, Breakwaters, Sea walls, Jetties.
Identifiers: Shorefront damage, Coastal environment, Beach restoration.

These guidelines are intended for general use by those who are interested in suitable and economical methods of shore protection. They cover basic points which should be considered in any analysis that leads to the selection and recommendation of a specific type of shore protection. The discussion of shore processes and natural protective features stresses the hazards which individual property owners face when they build within the zone of shoreline fluctuations. It is emphasized that a portion of the beach area belongs as much to the sea or lake as to the land, and that the beach area may be periodically inundated or eroded. Several ways to reduce shorefront damages are discussed: (a) conservation - preserving and enhancing natural protective features such as dunes, vegetation and natural sand supply; (b) structural - preventing sea waves from reaching erodible shore formations by use of structures such as offshore breakwaters; (c) structural to restore or enhance natural processes - by restoring and maintaining protective beaches and dunes by direct placement of sand from inland or ocean sources. Part of the value of the guidelines is its combination of many basic findings from research, study and observation of the complex phenomena related to the coastal environment. (Strachan-Chicago)
W72-08539

HOLLOW CREEK WATERSHED PROJECT, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-203 233-F, $3.00 in paper copy, $0.95 in microfiche. December 10, 1971. 10 p, 1 map, 1 tab.

Descriptors: *Watersheds (Basins), *Environmental effects, *Watershed management, *Land management, *Flood protection, Project planning, Erosion control, Water conservation, Multiple-purpose projects, Sediment yield, Streams, Flood-

walls, Channels, Land use, Flood control, *South Carolina.
Identifiers: *Environmental impact statements, *Hollow Creek watershed (SC).

The project, located in Lexington and Saluda Counties, will provide conservation land treatment for the watershed and will be supplemented by two flood water retarding structures. The project will reduce erosion and floodwater damages, provide new wildlife habitats, reduce sediment leaving the watershed, and create 91 acres of lake fishery at the sediment pools. Adverse environmental effects include elimination of agricultural and wildlife habitats on 91 acres, periodic interruption of agriculture and wildlife in the 125 acres of flood pools, elimination of agricultural and wildlife use of 25 acres utilized for dams and spillways until revegetation, inundation of 1.5 miles of stream channels, increased vehicular traffic, and temporary degradation of ambient air quality. Alternatives considered included conservation land treatment alone, alternate combinations of floodwater retarding structures, channel improvement to supplement floodwater retarding structures, and less intensive flood plain use. The project will provide long term flood protection. Irreversible commitments of resources are limited to the inundation of 1.5 miles of stream channels, 102 acres of woodlands, and 4 acres of pasture. Comments of other agencies are included. (Horwitz-Florida)
W72-08631

VIRGINIA BEACH, VIRGINIA--BEACH EROSION CONTROL AND HURRICANE PROTECTION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.

Available from the National Technical Information Service as PB-204 839-D, $3.00 in paper copy, $0.95 in microfiche. November 1971. 21 p, 3 plate, append.

Descriptors: *Virginia, *Environmental effects, *Beach erosion, *Coastal engineering, *Dredging, Sea walls, Hurricanes, Flood protection, Shore protection, Tidal effects, Recreation facilities, Dunes, Borrow pits, Concrete structures, Sands, Construction materials, Non-structural alternatives, Zoning, Shellfish, Aesthetics, Aquatic habitats.
Identifiers: *Environmental impact statements, *Virginia Beach (Va.).

The beach erosion and hurricane protection plan for Virginia Beach involves structural and non-structural measures. Structural aspects involve construction of sheet pile walls along the beach and the raising and widening of the beach. At the north end of the beach a 25-foot wide, 16-foot high dune will be constructed. Environmental impacts include reduction in hurricane damage; reduced beach erosion; enhancement of recreational opportunities; and removal of 2.5 million cubic yards of sand for initial beach construction, with an additional 133,000 cubic yards for annual maintenance. Adverse impacts include loss of inland agricultural sites due to dredging; however, borrowing areas can be graded and made into aesthetically pleasing recreation sites. Dredging in Chesapeake Bay will result in temporary damage to shellfish resources. Some restriction of the ocean view from residences can be expected from construction of the dunes. Alternatives include strictly non-structural measures which would not entirely prevent hurricane damage. Other structural measures considered include jetties, sea walls, and flood proofing. Short term uses include temporary loss of beach recreation and curtailment of agriculture in borrow areas. (Grant-Florida)
W72-08634

RED LICK CREEK WATERSHED, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-08637

WATERLOO, IOWA, LOCAL PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Rock Island, Ill.

Available from the National Technical Information Service as PB-201 850-F, $3.00 in paper copy, $0.95 in microfiche. October 8, 1971. 17 p, 1 map.

Descriptors: *Environmental effects, *Flood control, *Dam construction, *Dredging, Structures, Flood plains, Levees, Rivers, Flood damage, Dams, Economics, Wildlife, Fish, Water quality standards, Vegetation, Turbidity, Project benefits, Project purposes, Iowa, Floods, Flood protection, Channel improvement, Wildlife habitats, Aquatic habitats.
Identifiers: *Environmental impact statements, *Waterloo (Iowa).

The flood control project will consist of earthen levees, concrete floodwalls, river channelization efforts, a small dam and detention reservoir, and other interior drainage facilities extending through an environmental area created by man. The project is designed to protect 4200 acres of residential, commercial, and industrial property and accelerate flood plain development. Alteration of the natural shoreline habitat, obstruction of views of natural areas, loss or alteration of aquatic environment, loss of bottomland habitat and upland vegetation, and a temporary deterioration of land areas by ponding are all considered adverse environmental effects. The alternative of no project would result in annual damage exceeding two million dollars. Precautions will be taken during dredging to avoid exceeding water quality standards. Irreversible commitments of resources include a loss of mineral resources and vegetation. Agency comments and a map of the project site are included. (Ilkson-Florida)
W72-08666

EAST FORK LAKE, EAST FORK MIAMI RIVER, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.

Available from the National Technical Information Service as PB-198 897-F, $3.00 in paper copy, $0.95 in microfiche. May 1971. 26 p.

Descriptors: *Dam construction, *Flood control, *Environmental effects, *Project planning, Damsites, Dam design, Dams, Water supply, Water storage, Flood protection, Lakes, Reservoirs, Flooding, Water management (Applied), Wildlife, Ohio, Rivers.
Identifiers: *Environmental impact statements, *East Fork, Miami River (Ohio).

The project damsite is on the East Fork of the Little Miami River about 25 air miles east of Cincinnati, Ohio. The project will provide for flood control as a unit of the Ohio River Basin general lake plan. Approximately 10,600 acres of land will be required and approximately 2,160 acres of primarily agricultural land will be inundated at the seasonal pool elevation. The ecology of the area would be modified by the slack water impoundment. The downstream environment will be enhanced through improved flood control, water quality control, and water supply. Adverse environmental effects include: inundation of agricultural land; conversion of 12 miles of scenic, free flowing stream into a slack water lake; a decrease in area wildlife; and an increase in future development due to the project's flood control protection. Alternatives include: a second damsite, use of different types of dams, and no development. Irreversible commitments of resources include: the loss of wildlife habitats, disruption in ecosystem through the destruction of a free flowing stream, and construction resources used for the project. Comments of other agencies are included. (Horwitz-Florida)
W72-08570

BLUE EYE CREEK WATERSHED PROJECT, ALABAMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-08671

HYDRAULIC MODEL STUDIES OF THE PUEBLO DAM SPILLWAY AND PLUNGE BASIN,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 08B.
W72-08718

STABILITY TESTS OF PROPOSED RUBBLE--MOUND BREAKWATERS, NASSAU HARBOR, BAHAMAS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-08810

FLOOD CONTROL PROJECT, RONDOUT CREEK AND WALLKILL RIVER, NEW YORK AND NEW JERSEY; (SOUTH ELLENVILLE, N.Y.) RONDOUT CREEK BASIN, AND SANDBURG CREEK, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.

Available from the National Technical Information Service as PB-201 375F, $3.00 in paper copy, $0.95 in microfiche. July 27, 1971. 23 p, 1 map.

Descriptors: *Flood control, *Levees, *Flood protection, *Environmental effects, *New York, River regulation, Check structures, Floodways, Chutes, Concrete structures, Diversion structures, Drainage systems, Flow augmentation, Bridge construction, River basins, Project planning, Project purposes, Aquifers, New Jersey.
Identifiers: *Rondout Creek (N.Y.), *Environmental Impact Statements.

The flood control improvement project is designed to protect Ellenville, New York from overflow and backwaters and involves construction of a system of levees, concrete chute, stilling basin, debris barrier, floodwalls and transition walls, bridge replacements, and associated interior drainage facilities. Environmental impacts of the proposed project include flood proofing of unprotected flood plains and improved environmental quality. Unavoidable adverse environmental effects include modification of the natural environment by removal of a natural stream section, including natural vegetation bordering on that section, and construction of the concrete chute which may diminish waters entering underground and recharging aquifers. Alternatives considered include reservoir control, stream diversion, and 'no development'. Comments of interested agencies are included. (Blank-Florida)
W72-08828

PAPILLION CREEK AND TRIBUTARIES, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Nebr.

Available from the National Technical Information Service as PB-202 292-F, $3.00 in paper copy, $0.95 in microfiche. November 1971. 50 p, 1 map.

Descriptors: *Flood protection, *River basin development, *Artificial lakes, *Dam construction, *Environmental effects, *Nebraska, Damsites, Impoundments, Flood control, Flood plains, Water quality control, Erosion, Oxygen sag, Silts, Multiple-purpose projects, Recreation, Project planning, Project purposes, Wildlife habitats, Postimpoundment, Erosion control, Water quality standards, Water pollution sources.
Identifiers: *Environmental impact statements, *Papillion Creek (Neb.).

The Papillion Creek drainage basin lies in eastern Nebraska. The proposed project involves construction of 20 dams and lakes to provide flood control, recreation, fish and wildlife, and wildlife, and downstream water quality benefits. Environmental impacts include reduction of property damage due to floods, reduction in the threat of loss of life, generally improved health conditionsm, and placement of substantial land area in public ownership for recreation, wildlife management, and hunting. Measures will be taken to improve water quality in relation to erosion and siltation. Unavoidable adverse environmental effects include inundation of agricultural land and wildlife habitats, increased urban use of land surrounding lakes resulting in additional water pollution sources, and possible breach of state minimum water quality standards from poor quality runoff and excess aquatic plant productivity. Alternatives to the proposed project are floodplain zoning, channel improvements and levees, flood proofing, and diversions. Comments of concerned agencies are included. (Blank-Florida)
W72-08831

BRISTOL HARBOR BREAKWATER, BRISTOL HARBOR, RHODE ISLAND (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-203 240-F, $3.00 in paper copy, $0.95 in microfiche. October 6, 1971. 31 p, 1 map, 12 tab.

Descriptors: *Rhode Island, *Breakwaters, *Environmental effects, *Shore protection, Coasts, Coastal structures, Navigation, Harbors, Shellfish, Commercial fishing, Costs, Currents (Water), Water circulation, Water quality control, Water pollution effects, Aesthetics, Coastal engineering, Water resources development, Beds under water, Stagnant water.
Identifiers: Environmental Impact Statements, Narragansett Bay (R.I.).

The project consist of a single offshore breakwater, 1600 feet long and 10 feet above mean low water, designed to improve navigation by protecting vessels and shore facilities from southerly storms in Bristol Harbor, Rhode Island. Hurricane protection is not provided. The harbor is located on the east side of Narragansett Bay and has no existing navigation project. Commercial fishing is a major industry. Environmental impacts include storm protection which will result in facility replacement cost reductions and shellfish habitat losses. Adverse impacts may arise if current shifts cause stagnation of discharged pollutants. This could increase destruction of shellfishing, aesthetically impair the harbor, and lower water quality objectives. Adverse impacts can be minimized but not entirely eliminated. Alternatives include an anchored inflatable barrier which is economically and technically prohibitive, alternate alignment of the barrier, and no development. Long term productivity may be hampered by magnification of the pollution problem. Irreversible commitments involve only a small area of shellfish habitat. Agency comments are included. (Grant-Florida)
W72-08843

LA FARGE LAKE, KICKAPOO RIVER, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District. St. Paul, Minn.
For primary bibliographic entry see Field 04A.
W72-09032

SAN ANTONIO CHANNEL IMPROVEMENT, SAN ANTONIO RIVER AND TRIBUTARIES, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.

Available from the National Technical Information Service as PB-204 032F, $3.00 in paper copy, $0.95 in microfiche. November 9, 1971. 37 p, 1 map, 2 tab.

Descriptors: *Environmental effects, *Flood control, *Diversion structures, *Texas, Excavation, Channel improvement, Flood plains, Culverts, Conduits, Conveyance structures, Channels, Dams, Floods, Flood protection, Channel flow, River flow, Bridge construction, Environmental control, Water quality.
Identifiers: San Antonio River (Tex.), *Environmental Impact Statements.

To meet flood control needs, 33 miles of channel rectification is underway along the San Antonio River and its tributaries in San Antonio, Texas. The channel improvements include excavating existing channels, paving open channels, constructing walls, culverts, new bridges, and low water crossings as well as beautification and environmental enhancement measures. Project construction is about 63% complete. The flood control and prevention measures proposed will have a beneficial environmental impact on the city. They will help provide for a cleaner, safer stream. Adverse effects include removal of a few large shade trees and reshaping several small natural rock outcroppings. Minor adverse effects, including a temporary increase in dust and noise, may be experienced during construction. Alternatives considered incluue: no action, and alternative combinations of flood control and flood plain zoning. The selected alternative accomplishes the desired objectives with the least detrimental environmental effects. Also included are comments from concerned agencies. (Nielsen-Florida)
W72-09041

GEOTHERMAL LEASING PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 04B.
W72-09044

VERMILION HARBOR, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-204 461-D, $3.00 in paper copy, $0.95 in microfiche. September 30, 1971. 18 p, 1 map, 5 tab.

Descriptors: *Environmental effects, *Channel improvement, *Harbors, Port authorities, Recreation, Breakwaters, Engineering structures, Safety, Excavation, Construction, Project planning, Weather, Storms, Benthos, Aquatic life, Navigable waters, Administrative agencies, Boats, Boating, Aquatic habitats, Recreation facilities, *Ohio.
Identifiers: *Environmental Impact Statements, *Vermilion Harbor (Ohio).

The project involves construction of a detached 'T' type breakwater, a westerly and an easterly approach channel, and river channel extension to permit safe entry into the harbor under reasonably fresh water conditions. Adequate depths in the river channel will also be provided. The river channel's bottom is below mean lake level for three miles from its mouth and has a relatively flat slope throughout its length, averaging less than 8 feet per mile. The project is expected to cause a temporary disturbance of benthonic aquatic life along with the noise, dust, and generally disruptive effects accompanying construction. Alternatives to the proposed project include construction at another location, varying either design dimensions or the type of breakwater construction, and no development. The project will maintain and enhance man's long-term enjoyment of his environment by improving navigational features. Construction commits the harbor to increased recreational use. Planning was coordinated with government agencies, environmentally oriented groups, and all known interested individuals. (Waldron-Florida)
W72-09053

CORTE MADERA CREEK FLOOD CONTROL PROJECT, MARIN COUNTY, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, San Francisco, Calif.

Available from the National Technical Information Service as PB-205 455-D, $3.00 in paper copy, $0.95 in microfiche. November 1, 1971. 40 p, 12 fig, 2 plate, 5 tab.

Descriptors: *California, *Environmental effects, *Channel improvement, *Flood control, *Dredging, Flood plains, Flood protection, Erosion control, Non-structural alternatives, River basin development, Channeling, Slopes, Shape, Excavation, Bypasses, Concrete structures, Wildlife habitats, Aesthetics, Public health, Water quality.
Identifiers: *Environmental Impact Statements, *Corte Madera Creek (Cal).

The project consists of dredging and channel excavation of the Corte Madera Creek for flood control purposes. An earth channel will extend from San Francisco Bay through the tidal basin with a concrete channel from the earth channel upstream to Sir Francis Drake Bridge. The remaining construction will be completed in two phases with completion of the Ross Creek phase in 1973. The environmental impact of the project includes standard project flood protection, greater land use development, promotion of recreation, improved water quality, bank erosion reduction, vector control improvement, loss of bank vegetation and riparian habitat, and loss of natural stream beauty. Adverse effects consist of the loss of riparian habitats and aesthetic loss. Non-structural measures would not solve flood problems in the urban areas. Underground by-passes and alternative channel routes might save natural stream qualities, but would be too costly. No action is considered too risky since new construction would be subject to periodic flooding. The project is required because the basin's long-term productivity is committed to urbanization. Placement of the concrete channel involves an irreversible commitment of valuable resources. (Grant-Florida)
W72-09057

TOCKS ISLAND LAKE PROJECT, DELAWARE RIVER, NEW JERSEY, NEW YORK, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.

Available from the National Technical Information Service as PB-202 972-F, $3.00 in paper copy, $0.95 in microfiche. October 1971. 226 p, 2 fig, 7 tab.

Descriptors: *Delaware River, *Environmental effects, *Dam construction, *Multiple-purpose projects, Alternate planning, Drainage, Water resources development, Multiple purpose reservoirs, Impoundments, Electric powerplants, Hydroelectric plants, Fishing, Fish migration, Fish types, Fish behavior, Recreation, Water supply, Relocation, Highway relocation, Adoption of practices, Insect control, Ponding, Eutrophication, Anadromous fish, Herrings, Lakes, New Jersey, New York, Pennsylvania.
Identifiers: *Environmental Impact Statements.

The project involves construction of a dam on the Delaware River about 5 miles north of the Delaware Water Gap in Pennsylvania which will create a 12,425 acre reservoir. The project will provide flood control, water supply, hydroelectric power with a power plant capacity of 70,000 KW, and recreation. The project area is sparsely populated, heavily forested flood plain. The following environmental impacts are noted: relocation of

structures, construction of flood protective works, ponding in certain areas during drawdown, reduction of fishing, loss of animal habitats, temporary aesthetic impairment, and sewage disposal problems from visitors attracted to recreational sites. Adverse impacts include loss of a natural stream; inundation of 10,000 acres of animal habitats; loss of fishing, especially shad; destruction of vegetation from road construction; and relocation of 2,600 basin residents. Alternatives include an alternate multi-purpose project, no-action, and alternate actions which avoid one or more adverse environmental effects. Long-term productivity outweighs short-term uses since future development would eventually consume the land to be inundated. Comments of interested agencies are included. (Grant-Florida)
W72-09058

SPEWRELL BLUFF LAKE, FLINT RIVER, GEORGIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.

Available from the National Technical Information Service as PB-201 390-D, $3.00 in paper copy, $0.95 in microfiche. June 18, 1971. 18 p, 2 plate.

Descriptors: *Georgia, *Environmental effects, *Flood control, *Hydroelectric plants, *Dam construction, Multiple purpose projects, Concrete dams, Damsites, Hydroelectric power, Flood protection, Water control, Water utilization, Navigation, Flow control, Spillways, Recreation, Artificial lakes, Stream fisheries, Lotic environment, Project planning, Project purposes.
Identifiers: *Environmental Impact Statements, *Spewrell Bluff Lake (Ga).

Spewrell Bluff Dam is part of a three project system designed to develop the power head of the upper Flint River. The project will control a drainage basin to provide flood control, hydroelectric power, recreation, and flow regulation for downstream navigation. The project will convert 13,300 acres of agricultural and timber lands to lake environment, provide electrical power generation, provide high quality recreation, and provide flood protection and groundwater recharge. Unavoidable adverse effects include inundation of timber and agricultural lands; alteration from a stream to a lake environment, thereby reducing the habitat for dependent species; and inconvenience and disruptions to inhabitants who must relocate. Alternatives to the proposed project include alternate sites and single purpose projects which are economically infeasible and 'no development'. (Blank-Florida)
W72-09059

OPTIMIZATION IN DESIGN OF HYDRAULIC NETWORKS, - DISCUSSION BY GRAHAME G. BOYNE.
Scottish Gas Board, Edinburgh.
For primary bibliographic entry see Field 06A.
W72-09064

8B. Hydraulics

SUPERCRITICAL FLOW IN CURVED CHANNELS--HYDRAULIC MODEL INVESTIGATION,
Army Engineer District, Los Angeles, Calif. Hydraulics Section.
D. A. Barela.
Report No 1-109, March 1972. 8 p, 9 fig, 31 plate, 4 tab, 2 append.

Descriptors: *Supercritical flow, *Open channel flow, *Turbulent flow, *Hydraulic models, Flumes, Hydraulics, Hydraulic similitude, Waves (Water), Hydraulic jump, Water levels, Profiles, Hydraulic gradient.
Identifiers: *Curved open channels.

A laboratory study of supercritical flow in trapezoidal, curved channels was made for the purpose of obtaining basic information required to establish design criteria. Various design curves were tested with and without spiral transitions, to ascertain the amount of superelevated flow produced in the curve by high-velocity flows and the consequent disturbance in the tangent downstream from the curve. Specifically, the factors to be determined were: (a) the length of spiral transition required to reduce the excessive disturbance in the curve and the tangent downstream, (b) the height of the superelevated water surface, (c) the pattern of disturbance, and (d) the development of safe design criteria. The model was constructed to an undistorted scale ratio of 1:25 and reproduced approximately 5000 ft of channel. Use of spiral transition curves definitely minimized both transverse and longitudinal waves in the curve. The 325-ft spirals reduced the amplitude of undulation only slightly, while the 600-ft spirals used for the two tests nearly eliminated the undulations entirely. (Knapp-USGS)
W72-08526

SPATIALLY VARIED OPEN-CHANNEL FLOW EQUATIONS,
Illinois Univ., Urbana. Water Resources Center.
B. C. Yen.
Available from the National Technical Information Service as PB-209 532. Illinois Water Resources Center, Research Report No 51, 1972. 63 p, 3 fig, 29 ref. OWRR B-043-ILL (4).

Descriptors: *Energy equation, *Open channel flow, Flow resistance, Fluid mechanics, Hydraulics, Momentum equation, Non-uniform flow, Unsteady flow.
Identifiers: *Spatially varied flow, Homogeneous fluids, Nonhomogeneous fluids, *Flow equations.

Recent developments and improvements in numerical techniques and computer capability enable more accurate numerical solutions of spatially varied flow problems such as various phases of urban storm runoffs. Consequently, it is desirable to re-examine the comptibility of the flow equations used in solving unsteady spatially varied flow problems. The continuity, momentum, and energy equations for unsteady nonuniform flow of an incompressible viscous nonhomogeneous fluid with lateral flow into or leaving a channel of arbitrary geometry in cross section and alignment are formulated in integral form for a cross section by using the Leibnitz rule. The resulting equations are then transformed into one-dimensional form by introducing the necessary correction factors and these equations can be regarded as the unified open-channel flow equations for incompressible fluids. The flow represented by these equations can be turbulent or laminar, rotational or irrotational, steady or unsteady, uniform or nonuniform, gradually or rapidly varied, subcritical or supercritical, with or without spatially and temporally variable lateral discharge. Various conventional equations used for open-channel flows are simplifications and approximations of special cases of the general equations. The inherent difference between the flow equations derived based on the energy and momentum concepts is also discussed.
W72-08588

HYDRAULIC MODEL STUDIES OF THE PUEBLO DAM SPILLWAY AND PLUNGE BASIN,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
T. J. Isbester.
Available from NTIS, Springfield, Va. 22151 as PB-204 882, Price $3.00 paper copy; 95 cents microfiche. Report REC-ERC-71-18, June 1971. 16 p, 16 fig, 1 tab.

Descriptors: *Hydraulic models, *Dams, *Spillways, *Hydraulic design, Colorado, Model studies, Structural engineering, Reservoir releases, Flow profiles, Channel erosion, Diversion structures, Diversion tunnels, Rocky Mountain Region, Testing, Analytical techniques.
Identifiers: *Arkansas River (Colo), *Pueblo Dam spillway, Plunge basin.

Pueblo Dam will be on the Arkansas River about 6 miles west of Pueblo, Colorado and will be a major feature of the Fryingpan-Arkansas Project. The project involves bringing water from the mountains on the west slope of the Continental Divide through a tunnel to the east side where it will supplement the Arkansas River for irrigation, municipal, and industrial needs. Studies were performed on a 1:56 scale hydraulic model of Pueblo Dam spillway and plunge basin to determine if the unusual design could handle the required releases safely. The model contained the flip-type spillway, plunge basin, river outlets, and a section of downstream river channel. Channel erosion, basin impact pressures, nappe oscillations, crest rating, and flow profile studies were made. Flow splitters were added to the spillway to eliminate nappe oscillations. The plunge basin initially containing 2 floor elevations was enlarged to the level of the deeper section to minimize impact pressures. A technique of data collection was used in obtaining impact pressures which provided an electronic statistical analysis. A curve was obtained to relate basin floor effective pressure head to spillway discharge for the normal river tailwater conditions. (Woodard-USGS)
W72-08718

STABILITY TESTS OF PROPOSED RUBBLE--MOUND BREAKWATERS, NASSAU HARBOR, BAHAMAS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. Y. Hudson, and R. A. Jackson.
Available from NTIS, Springfield, Va. 22151 as AD-734 099, Price $3.00 paper copy, $0.95 microfiche. Miscellaneous Paper No 2-799, March 1966. 11 p, 17 photo, 6 plate.

Descriptors: *Hydraulic structures, *Breakwaters, *Harbors, *Model studies, Testing, Flumes, Waves (Water), Analytical techniques, Engineering structures, Hydraulic design, Coasts, Protection, Evaluation.
Identifiers: *Nassau Harbor (Bahamas).

Three series of model tests were conducted in a wave flume 5 ft. wide, 4 ft. deep, and 119 ft. long, using linear scales of 1:55.0, 1:46.5, and 1:42.5, to determine the stability of proposed rubble-mound breakwaters with cover layers composed of tribar armor units for Nassau Harbor (Bahamas). The stability of the breakwater sections, as a function of wave height, was observed visually; the heights of waves on the harborside of the test sections, generated by wave overtopping and wave energy that was transmitted through voids in the upper portions of the breakwaters, were measured by an electrical wavegage and oscillograph assembly. It was concluded that: a. The breakwater sections using tribar armor units will be stable for the selected design waves; b. the selected design waves are conservative; c. wave heights behind the proposed breakwaters, caused by wave overtopping and wave energy that is transmitted through the voids in the breakwater, are not considered significant when compared with the heights of waves that enter through the navigation opening during storms, and the heights of waves generated inside the harbor by local winds. (Woodard-USGS)
W72-08810

A STOCHASTIC MODEL DESCRIBING THE WATER MOTION IN A RIVER,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Mathematics.
For primary bibliographic entry see Field 02E.
W72-08819

8C. Hydraulic Machinery

FULL SCALE TESTING OF THE HIGH SEAS OIL CONTAINMENT BARRIER (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-08630

A NEW APPROACH TO SHIELDING AGAINST DIRECT LIGHTNING STROKES,
Electricity Commission of New South Wales (Australia); and Gutteridge, Haskins and Davey, New South Wales (Australia).
B. P. McRae, and A. V. Hromas.
Institution of Engineers, Australia, Electrical Engineering Transactions, Vol EE7, No. 2, p 33-44, Sept 1971. 23 fig, 3 tab, 30 ref, 4 append.

Descriptors: *Lightning, *Transmission lines, Overhead ground wire, Extra high voltage, Ionization, Electric current, Statistical analysis, Bibliographies.
Identifiers: *Lightning protection, *Shielding, Australia, Thunderclouds, Pathfinder Project, Outages, Electric discharges, Electric coronas, Static electricity.

A new approach to shielding against direct strokes of lightning is developed, based on recent statistical data and Griscom's work on the theory of the lightning descent mechanism. Most lightning discharges are considered to be lowered from cloud to ground or structure. Near the ground plane, the effective strike radius is determined in terms of altitude, voltage, charge, and capacitance inherent in the prestrike condition. The charge of the prestrike corona burst is determined in terms of statistical data on maximum current amplitudes and rising time to reach maximum current value. Collation and correlation of these data have made possible estimates of exposure to direct lightning strokes and probability of penetration past shielding. The theory gives a clearer picture of the conditions just prior to flashover of lightning to ground or to a high structure. Methods and curves are given to facilitate design of shielding arrangements and a comparison is made with accepted shielding criteeria. (USBR)
W72-08770

POWER IN THE YEAR 2001,
For primary bibliographic entry see Field 06B.
W72-08771

MT. ELBART PUMPED-STORAGE POWERPLANT FRYING PAN-ARKANSAS PROJECT, COLORADO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.

Available from the National Technical Information Service as PB-203 507F, $3.00 in paper copy, $0.95 in microfiche. October 19, 1971. 42 p, 1 map, 5 photo.

Descriptors: *Pumped storage, *Multiple-purpose projects, *Colorado, *Environmental effects, Electric powerplants, Powerplants, River basin development, Water resources development, Alternate planning, Federal government, Project purposes, Recreation, Fishing, Impoundments, Water distribution (Applied), Hydroelectric plants, Thermal pollution, Water temperature, Adoption of practices, Aquatic environment, Excavation, Dam construction, Turbidity.
Identifiers: *Environmental Impact Statements, *Frying Pan-Arkansas project.

The Mt. Elbart pumped-storage powerplant is a major element of the multi-purpose Frying-pan-Arkansas Project. Twenty percent of the 200 megawatt output of the plant will be supplied by project water. The balance will be produced by pumped water from nearby Twin Lakes. The project is intended to help meet the rising demand for power in Colorado. The powerplant will be 15 stories high, but only the top flood will be above ground level. Approximately 2.7 million cubic yards of earth will be excavated. Environmental impact of the project includes temporary visual impact to the landscape, temporary impact on aquatic life, possible harm to shrimp and fish from increased water temperature, increased lake depths, and evacuation of water. Unavoidable adverse effects include temporary aesthetic scarring, indeterminate fish losses, and temporary water turbidity. Alternatives considered include no powerplant, which would necessitate modification of the project and lessen the adverse effect on lake biota and construction of a fossil fuel plant. Long-term advantages seem to outweigh the environmental disadvantages. Extensive agency comment is included. (Grant-Florida)
W72-08850

DESALINATION PROCESS BY MULTI-EFFECT, MULTI-STAGE FLASH DISTILLATION COMBINED WITH POWER GENERATION,
American Machine and Foundry Company, York, Pa. (Assignee).
For primary bibliographic entry see Field 03A.
W72-09016

OIL RECOVERY AND CLEANUP SYSTEM,
For primary bibliographic entry see Field 05G.
W72-09018

OIL SKIMMER WITH OSCILLATABLE CIRCULAR LOOP,
For primary bibliographic entry see Field 05D.
W72-09019

APPARATUS AND METHOD FOR CONFINING AND COLLECTING OIL FLOATING ON A WATER SURFACE,
For primary bibliographic entry see Field 05D.
W72-09020

APPARATUS FOR PREVENTING OIL POLLUTION,
Texaco Inc., New York. (Assignee).
For primary bibliographic entry see Field 05G.
W72-09022

HIGH-STRENGTH FIRE-RESISTANT SPILL CONTROL BOOMS,
For primary bibliographic entry see Field 05G.
W72-09023

IMPORTATION OF LIQUEFIED NATURAL GAS UNDER THE NATURAL GAS ACT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Federal Power Commission, Washington, D.C.

Available from the National Technical Information Service as PB-201 853-D, $3.00 in paper copy, $0.95 in microfiche. August 16, 1971. 18 p, 3 map.

Descriptors: *Maryland, *Georgia, *Environmental effects, *Natural gas, Facilities, Pipelines, Engineering structures, Dredging, Piers, Industrial plants, Water quality control, Storage requirements, Turbidity, Tidal marshes, Aesthetics, Chesapeake Bay, Water pollution sources, Thermal pollution.
Identifiers: *Environmental Impact Statements, *Natural Gas Act, *Liquefied natural gas.

The projects involve construction at Cove Point, Maryland and Savannah, Georgia of a marine terminal, above ground storage tanks for liquid natural gas, pumping facilities, and pipeline construction in order to receive the equivalent of 1 billion cubic feet of natural gas per day imported from Algeria. Environmental impacts include: commitment of large land areas for facility and pipeline construction, dredging resulting in temporary turbidity, sediment disruption, discharge of cooled water which might alleviate existing thermal pollution at Savannah, temporary disruption of landscape and river flows during pipeline construction, and traversing of marshland by the pipeline in the Savannah Wildlife Refuge. Adverse impacts include turbidity from dredging loss of trees from pipeline construction, and extensive land commitment. Alternate sites were considered and alternate sources of natural gas were studied. The chosen source and sites were the most desirable economically and ecologically. Short-term usage will not permanently impair land productivity. Pipeline routes and facility sites will be irreversible commitments. (Grant-Florida)
W72-09052

BROOMFIELD, COLORADO WATER TRANSMISSION LINE, PROJECT WSP CO-08-00-0110, BROOMFIELD, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of Housing and Urban Development, Denver, Colo. Region VIII.

Available from the National Technical Information Service as PB-205 340-D, $3.00 in paper copy, $0.95 in microfiche. December 23, 1971. 49 p, 16 map, 4 tab.

Descriptors: *Environmental effects, *Water supply, *Water supply development, *Water conveyance, *Colorado, Water demand, Water requirements, Water utilization, Water sources, Water resources, Water resources development, Water management (Applied), Conveyance structures, Water quality, Water pollution, Turbidity, Land use, Project benefits, Project purposes, Pipelines, Pumping plants, Reservoirs, Urbanization, Diversion.
Identifiers: *Environmental Impact Statements, *Broomfield (Colo).

The project consists of the construction of water transmission facilities, a pipeline, pumping station, and a reservoir to serve urban areas. The present water supply is limited in capacity and very expensive. Furthermore, the area is very vulnerable because it has only a single transmission line from a single water source. Water quality problems could result if the project pollutes the aquifer, but this is highly unlikely. Flora destruction will be minimal since burial of the pipeline will be done along existing roads. Wildlife should not be affected. A major effect of the project involves changes in land use: development will change agricultural use to residential and commercial use. A number of short range effects will result from construction. Turbidity from erosion of backfill will be most noticeable. A number of alternate water transmission facilities were considered, but none of them would mitigate adverse environmental effects of the proposed design. Projected land uses of the area are set forth in an appendix. (Brackins-Florida)
W72-09056

DEVELOPMENT OF ECONOMIC WATER HARVEST SYSTEMS FOR INCREASING WATER SUPPLY,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 03B.
W72-09060

DYNAMIC PROGRAMMING IN A HYDROELECTRIC SYSTEM,
Aluminum Co. of Canada Ltd., Arvida (Quebec).
For primary bibliographic entry see Field 06A.
W72-09082

8D. Soil Mechanics

HIDDEN LAKE, FRESNO RIVER BASIN, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District. Sacramento, Calif.

Available from the National Technical Information Service as PB-200 445-F, $3.00 in paper copy, $0.95 in microfiche. June 29, 1971. 32 p, 4 map, 6 disc.

Descriptors: *Reservoir construction, *Environmental effects, *Flood protection, *Dam construction, Project planning, Dams, Levees, Earthworks, Flood control, Riparian land, Riparian waters, Construction, Reservoirs, Channels, Irrigation, *California.
Identifiers: *Environmental impact statements, *Fresno River Basin (Calif.).

The proposed plan involves construction of an earthfill dam across the Fresno River about 15 miles northeast of Madera, Califronia, construction of four small dikes, downstream clearing and enlarging of channels, and associated levee construction. The resulting reservoir will contain 1,570 surface acres of water. Environmental impacts include conversion of a free flowing intermittent river into a lake, stabilization of seasonal distribution of water flows downstream, acquisition of irrigation waters for dry farmland, flood protection for Madera, elimination of some turbidity and sediment associated with floods, and the loss of 5-10 miles of riparian vegetation. Adverse environmental effects include the loss of 1,570 acres of land by inundation; substantial loss in riparian habitat; and increased concentrations of salts, nutrients, and pesticides from increased agricultural use. Alternatives include channel improvements only, channel improvements with a single-purpose irrigation reservoir, a multiple-purpose reservoir without channel improvements, and no development. Irreversible commitments of resources include the inundation of lake area, loss of six miles of riparian values within the lake, and impairment of 5-10 miles of natural stream banks. Comments of other agencies are included. (Horwitz-Florida)
W72-08629

NEW HOPE LAKE, NORTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Wilmington, N.C.

Available from the National Technical Information Service as PB-198 999-F1-3, $15.00 in paper copy, $0.95 in microfiche. Vols. 1-3, November 1971. 704 p.

Descriptors: *Environmental effects, *Artificial lakes, Water resources development, *Flood control, *Dam construction, Earth dams, Impoundments, Impounded waters, Water quality control, Recreation, Water supply, Land use, Flow regulation, Wildlife habitats, Reservoirs, Water storage, Project purposes, Project benefits, Economic justification, Area redevelopment, Flood plain zoning, Floodproofing, Multiple-purpose projects, *North Carolina.
Identifiers: *Environmental impact statements, *New Hope Lake (NC).

The project consists of construction of an earth dam and a lake for flood control, water supply, water quality control, recreation, and fish and wildlife enhancement. About 22 miles of free flowing stream and 14,300 acres will be inundated, causing a reduction in wildlife habitats. Furthermore, the project will reduce overbank flooding downstream; consequently another 19,000 acres of wildlife habitat downstream will be lost from conversion of land to other uses. The lake will initially display eutrophic tendencies after filling due to organic matter congregating within the pool area, but an equilibrium will be reached after a few years. Alternatives considered included a dry dam, abandonment of the project, a series of small dams, and several non-structural alternatives such as flood plain zoning. Balanced against the long term loss of productive lands is the creation of a multipurpose impoundment to meet the demands of increased commercial and industrial growth. In addition to comments from interested agencies, comments and correspondence from environmental groups and citizens are included. An economic data memorandum is included, as well as transcripts of depositions taken on behalf of environmental groups in litigation opposing this project. (Brackins-Florida)
W72-08639

COTTONWOOD CREEK DAM, IDAHO, PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.

Available from the National Technical Information Service as PB-198 724-F, $3.00 in paper copy, $0.95 in microfiche. October 1971. 35 p, 1 dwg, 4 tab.

Descriptors: *Environmental effects, *Flood control, *Dam construction, *Flood protection, Floods, Flood flow, Recreation, Fish, Wildlife, Dams, Structures, Spillways, Conduits, Sediments, Storms, Land management, Watershed management, Idaho, Project benefits, Wildlife habitats, Aquatic habitats, Earth dams, Air pollution, Rockfill dams.
Identifiers: *Environmental impact statements, *Cottonwood Creek (Idaho).

The project is designed to give local flood protection. It will consist of an earth and rockfill dam, an ungated spillway, and an uncontrolled outlet conduit corresponding to the creek's downstream channel capacity. Due to the placement of the conduit, no permanent pool would be formed. The creek is presently plagued with occasional flash-type, high-sediment floods from high intensity thunderstorms, and floods from general storm rainfall and snowmelt. This project would virtually eliminate floods which threaten a highly developed residential area of Boise. It would also encourage further development in the area. The area behind the dam would be available for recreation. The project would not adversely influence any unique condition and would have minimal impact on overall fish, wildlife, and associated resources. There will be temporary air and noise pollution. Abandoning the project would forego the net benefits. Another alternative would be to increase watershed treatment and land management to reduce rainfall runoff. This is not a complete alternative in itself but is being considered in conjunction with detention dam construction design. Agency responses are included. (Ilkson-Florida)
W72-08665

LOS ESTEROS RESERVOIR, SANTA ROSA, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Albuquerque, New Mex.

Available from the National Technical Information Service as PB-202 431-F, $3.00 in paper copy, $0.95 in microfiche. October 1971. 69 p, 1 map, 25 tab.

Descriptors: *Environmental effects, *Dam construction, *Reservoir construction, *Flood protection, Flood control, Flood damage, Flood flow, Flow rates, Rockfill dams, Earth dams, Sediment control, Reservoir operation, Surface irrigation, Multiple-purpose projects, Water resources development, New Mexico.
Identifiers: *Environmental impact statements, *Pecos River (NM).

Construction of an earth and rolled rockfill dam, a tunnel type conduit, an uncontrolled spillway channel, and an access road is proposed in Guadalupe County, New Mexico. The dam site on the Pecos River is located approximately seven miles upstream from Santa Rosa, New Mexico. The dam would be utilized for flood control, sediment control, and irrigation storage. One adverse effect of the project is the elimination of 7,360 acres of wildlife habitat through periodic flooding of the irrigation pool. The scenic quality of the area will also be reduced. Native grasses and other small plants may be damaged by sediment deposits; about 14 miles of free-flowing stream will be converted into a slack water area. Alternatives considered include: diversion, collection and confining levees, channel improvements, multiple and single purpose reservoirs, non-structural alternatives, and no-development. However, the selected project is the only economically feasible method to provide flood and sediment control and irrigation storage. Comments of concerned agencies are included. (Kohla-Florida)
W72-08672

AN INVESTIGATION OF MOISTURE CHANGES AND SOIL STRUCTURE IN EARTH DAMS,
Snowy Mountains Hydro-Electric Authority, Cooma (Australia).
M. S. Kotowicz, and S. N. Kiek.
Proceedings, 1st Australia-New Zealand Conference on Geomechanics, Vol 1, Melbourne, Australia, p 160-164, Aug 1971. 2 fig, 3 tab, 14 ref.

Descriptors: *Optimum moisture content, *Moisture content, *Earth dams, *Soil compaction, On-site investigations, Soil structure, Pore pressure, Proctor curves, Laboratory tests, Curing, Soil mechanics, Clays, Soil moisture, Cation exchange, Adsorption.
Identifiers: *Optimum moisture content, Clay barriers, Exchangeable sodium percentage, Blowering Dam (Australia), Jindabyne Dam (Australia), Proctor curves, Rolled fills.

Optimum moisture content (OMC) of a soil is generally considered constant under uniform compaction, but tests show OMC may vary considerably depending on initial soil moisture and curing time. This OMC variance can cause crucial problems in earth dam construction because the pore pressures that develop upon compaction are dependent upon the placement moisture content. Problems developed when Jindabyne Dam was found to have considerably smaller pore pressures than expected and Talbingo Dam had considerably higher pore pressures. Comparison of field and laboratory compaction tests showed the laboratory OMC was 2.5% higher for Jindabyne Dam and 1.5% lower for Talbingo Dam. Tests to determine factors affecting compaction test results revealed: (1) a 9% increase in initial soil moisture caused a 2.5% increase in OMC, (2) curing time also affected OMC, and (3) the soil moisture content changed during curing. The reason for the OMC changes are unknown, but apparently are not caused by structural rearrangement and consequent transfer between adsorbed and free moisture. The standard compaction test should be reviewed. (USBR)
W72-08754

THE USE OF IN-SITU TESTS IN A STUDY OF THE EFFECTS OF FISSURES ON THE PROPERTIES OF STIFF CLAYS,
Building Research Station, Garston (England).
A. Marsland.
Proceedings, 1st Australia-New Zealand Conference on Geomechanics, Vol 1, Melbourne, Australia, p 180-189, Aug 1971. 8 fig, 13 ref.

Descriptors: *On-site tests, *Clays, *Fissures (Geologic), *Soil tests, *Soil strength, Shear strength, Soil properties, Laboratory tests, Boreholes, Soil mechanics, Fractures (Geology), Samples, Test results.
Identifiers: *Direct shear, *Plate load tests, Shear box, Plate bearing tests, London, Triaxial tests, Penetrometers, Test equipment, Loading tests.

Large variations in shear strengths and moduli obtained from triaxial tests on stiff fissured clays caused the validity of the test procedures to be questioned. An investigation using larger in situ shear tests indicated strengths of fissured clay were considerably lower than the average values determined from triaxial tests. In situ plate loading tests were used to obtain information for piled foundation design. An 865-mm-dia plate was placed in the bottom of a borehole and the settlement under load determined. Fissured clay strengths calculated from the plate tests were from 0.57 to 0.91 of those determined from triaxial tests. In situ shear box tests were used to determine soil strengths for a large power station. The peak shear strengths measured by the 610-mm-square shear box fell within the range of values determined by triaxial tests on 75- and 125-mm-dia specimens. Each fissured clay design problem must be considered individually, but generally, large in situ tests provide more realistic values of soil properties than laboratory or small in situ tests. (USBR)
W72-08756

HEADWATERS-YELLOW RIVER PROJECT MEASURE, GWINNETT COUNTY RESOURCE CONSERVATION AND DEVELOPMENT PROJECT, GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Lawrenceville, Ga.
For primary bibliographic entry see Field 04D.
W72-08846

CHOPTANK RIVER, CAROLINE COUNTY, MARYLAND (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer, District, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W72-08849

CLIFTY CREEK LAKE, CLIFTY CREEK, WABASH RIVER BASIN, INDIANA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.

Available from the National Technical Information Service as PB-205 229D, $3.00 in paper copy, $0.95 in microfiche. October 9, 1970. 6 p, 1 map.

Descriptors: *Indiana, *Environmental effects, *Dam construction, *Flood protection, *Multiple-purpose projects, Flood control, Project purposes, Recreation, Water resources development, Watersheds (Basins), Multiple-purpose reservoirs, Fishing, Wildlife habitats, Water quality control, Aesthetics, Dikes, Non-structural alternatives, River basins, River basin developments.
Identifiers: *Environmental Impact Statements, *Wabash River Basin (Ind), *Clifty Creek (Ind).

The proposed multipurpose project would be located on Clifty Creek in Bartholomew and Decatur counties, Indiana. The project involves construction of an 88-foot high, 7,000-foot long dam which would be designed to provide flood control, recreation, and fish and wildlife protection. The project area topography is gently rolling countryside. Environmental impacts of the project include inundation of approximately 2,400 acres of land at flood pool, the use of an additional 1,000 acres, reduction of flood damage, and improved water quality and consequent enhancement of fishing and aesthetic appeal. Adverse impacts include inundation of 1,000 acres of farm land and wildlife habitat at seasonal pool, permanent loss of six miles of free flowing stream and bank cover, and partial loss of natural beauty. The extreme alternative is to retain the area in its natural state. This would result in a loss of flood control and recreational benefits. Non-structural alternatives are unsuitable due to the agricultural character of the area. Irreversible commitments of resources include six miles of natural stream and 2,400 acres of inundated farm land. (Grant-Florida)
W72-08852

MISSISSIPPI RIVER, EAST BANK, WARREN TO WILKINSON COUNTIES, MISSISSIPPI, VICKSBURG- YAZOO AREAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 04A.
W72-08853

CHENA RIVER LAKES FLOOD CONTROL PROJECT, FAIRBANKS, ALASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.

Available from the National Technical Information Service as PB-201 532F, $3.00 in paper copy, $0.95 in microfiche. October 1971. 69 p, 7 plate, 6 tab.

Descriptors: *Environmental effects, *Alaska, *Flood protection, *Earth dams, *Levees, Damsites, Dam construction, Earthworks, Impoundments, Flood control, Floodways, Flood plains, River basin development, Turbidity, Oxygen sag, Water quality control, Eutrophication, Snowmelt, Flood flow, Surface runoff, Project planning, Project purposes, Lakes, Rivers.
Identifiers: *Chena River (Alaska), *Tanana River (Alaska), *Little Chena River (Alaska), *Environmental Impact Statements.

The project area is within the Chena and Tanana River flood plains near Fairbanks, Alaska and is subject to major floods resulting from snowmelt and/or rainfall. The proposed project is designed to protect the surrounding community from flood damage. Two earthfill dams will regulate and restrict the Chena and Little Chena Rivers while a levee system will control the Tanana River. Environmental impacts of the proposed project include flood protection, dislocation of 32 families and/or businesses, impoundment of terrestrial habitats and a natural stream section, acceleration in development of the protected flood plain, creation of recreational opportunities, and possible provision for fish and wildlife habitats. Unavoidable adverse environmental effects will include elimination of plants and animals in impounded terrestrial habitats and in areas of habitats to be occupied by flood control structures, possible water quality problems in reservoir and discharge water, and termination of periodic downstream flooding which will be adverse to those plant communities dependent on such inundation. Alternatives to the proposed project include no development, an alternative dam site, floodway and levees, relocation, and flood plain management. Comments of concerned agencies are included. (Blank-Florida)
W72-09035

RAILROAD CLOSURE STRUCTURE, BEACH CITY LAKE, SUGAR CREEK, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-204 570-D, $3.00 in paper copy, $0.95 in microfiche. September 23, 1971. 8 p, 3 fig.

Descriptors: *Environmental effects, *Ohio, *Flood control, *Levees, *Flood protection, *Storage capacity, Dams, Reservoirs, Erosion, Lakes, Storms, Storm water, Railroads, Project benefits, Economics, Spillways, Spillway gates, Overflow, Sediments, Administrative agencies, Storm runoff.
Identifiers: *Environmental Impact Statements, *Beach City Lake (Ohio).

The project involves construction of a closure structure consisting of a gated opening in a railroad cut and an earthen levee to avoid potential lake overflow through the railroad cut and adjacent low grounds during full utilization of reservoir flood control storage. The immediate vicinity is rural. A series of storms could cause the lake to overtop the levees and result in uncontrolled flow down the railroad cut. The improvement will permit greater storage to prevent involuntary spilling. Loss of a portion of a farm field, possibility of sediment deposit on railroad tracks, and temporarily increased erosion are the only expected adverse effects. To take no action would fail to take full advantage of the reservoir's storage potential, jeopardize the dam's integrity and the safety of persons downstream, and continue the risk of damage to the railroad. Abandoning the railroad is deemed impractical as are alternatives involving its relocation. Increasing the height of levees, widening the spillway, and other methods of closure were also deemed unworkable. Long term use of the environment will be minimally impaired. Comments from interested agencies have been requested. Two maps and one plan are included. (Ilkson-Florida)
W72-09054

8E. Rock Mechanics and Geology

CORPUS CHRISTI SHIP CHANNEL, PORT ARANSAS BREAKWATER, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 04A.
W72-08668

MEASUREMENT OF TENSILE STRENGTH BY DIAMETRAL COMPRESSION OF DISCS AND ANNULI,
Cold Regions Research and Engineering Lab., Hanover, N.H.
M. Mellor, and I. Hawkes.
Engineering Geology, Vol 5, No 3, p 173-225, Oct 1971. 33 fig, 34 ref, append.

Descriptors: *Tensile strength, *Testing procedures, *Rock mechanics, *Laboratory tests, Stress distribution, Griffith theory, Tensile stress, Compression tests, Rock properties, Bibliographies, Brittleness, Rings, Glass, Plastics, Ice, Rock tests, Tests.
Identifiers: *Splitting tensile strength, Test equipment, Griffith theory, Tensile properties, Disks (Shapes), Tension tests, Annuli, Brazilian test, Uniaxial tension strength, Uniaxial tests, Crack propagation.

Diametral compression of disks and annuli were investigated theoretically and experimentally as an alternative to the more difficult uniaxial tensile test. The disk test (Brazil test) was preferable to the ring (annulus) test for the following reasons: (1) For Griffith-type materials, such as rocks, the disk test is capable of measuring uniaxial tensile strength, but the ring test with a small hole gives values greatly in excess of the uniaxial tensile strength. (2) The disk test stresses a relatively large volume of material to the critical level, whereas the ring test confines peak stress to a small volume. (3) The disk test appears relatively insensitive to inelastic behavior and nonlinearity, but the ring test is highly sensitive. (4) Preparing a disk specimen requires less than half the work needed for a ring specimen. (5) Disk tests are satisfactorily reproducible. Specimen dimension, size effects, loading rates, contact stresses, force readouts, and preparations are discussed. Recommended procedures for the disk tests are outlined. (USBR)
W72-08752

AFTERSHOCKS CAUSED BY PORE FLUID FLOW,
Stanford Univ., Calif. Dept. of Geophysics.
A. Nur, and J. R. Booker.
Science, Vol 175, No 4024, p 885-887, February 25, 1972. 2 fig, 13 ref.

Descriptors: *Earthquakes, *Rock mechanics, *Porosity, *Flow, Groundwater movement, Faults (Geologic), Seismic waves, Model studies, Stress, Geophysics, Earth pressure, Fractures (Geologic).

Identifiers: *Aftershocks, Fluid pore pressure.

Studies of the relationship of earthquake shocks to transient pore pressures and flow in rocks are described. The frequency of occurrence of aftershocks that follow large shallow earthquakes decays from thousands of aftershocks the first day to 10 per day or less 100 days later. During the earthquake the pore pressure will change by an amount equal to the volumetric stress change. Fluid pore pressure changes occur that are comparable to stress drops on faults associated with earthquakes. The subsequent redistribution of pore pressure as a result of fluid flow decreases the rock strength and may result in delayed fracture. It is concluded that the flow of groundwater can provide the viscous element necessary to produce aftershock sequences. (Lang-USGS)
W72-08812

HARDNESS, TENSILE STRENGTH, AND IMPACT TOUGHNESS OF RESERVOIR SANDSTONE AT EXTREME TEMPERATURES,
Bureau of Mines, Morgantown, W. Va. Morgantown Energy Research Center.
C. A. Komar.
Available from NTIS, Springfield, Va, 22151 as PB-205 498, Price $3.00 paper copy; $0.95 microfiche. Bureau of Mines Report of Investigations RI-7571, 1971. 8 p, 4 tab, 8 ref.

Descriptors: *Underground storage, *Waste disposal, *Liquid wastes, *Rock properties, *Differential thermal analysis, Sandstones, Groundwater movement, Water pollution control, Brines, Injection wells, Geologic formations, Tensile strength, Testing, Analytical techniques, Fractures (Geologic).
Identifiers: Underground reservoirs.

Hardness, tensile strength, and impact toughness of dry and brine-saturated sandstone specimens were measured at ambient, cryogenic, and elevated temperatures as a measure of the relative stability of reservoir rocks for subsurface disposal of liquid wastes. Hardness measurements were inconclusive. Tensile strength and impact toughness were significantly higher at -320 F than at ambient temperature, but were relatively unaffected at 700 F. Impact toughness was reduced by subjecting the specimens to three cycles of rapid temperature changes (thermal shock) over a 1,000 F range. Tensile strength of brine-saturated sandstone was less than that of dry sandstone. Reservoir sandstone likely would be stable if exposed to extreme temperatures of liquid wastes, although rapid changes in waste temperatures should be avoided. (Woodard-USGS)
W72-08813

8F. Concrete

PATTERN LOADING ON REINFORCED CONCRETE FLAT PLATES,
Waterloo Univ. (Ontario).
J. C. Jofriet, and G. M. McNeice.
Journal of the American Concrete Institute, Proceedings, Vol 68, No 12, p 968-972, Dec 1971. 4 fig, 1 tab, 5 ref, append.

Descriptors: *Finite element method, *Reinforced concrete, *Structural analysis, Concretes, Loads (Forces), Load distribution, Deflection, Columns, Spans, Structural engineering.
Identifiers: *Concrete slabs, *Flat plates, Combined loading, Canada, Bending moments, Live loads, Dead loads, Panels.

The effect of pattern loading on the bending behavior of a concrete flat plate is examined. A finite element bending analysis is used to investigate the influence on moment and deflection ratios of column flexural stiffness, aspect ratio of panels, ratio of clear span to center-to-center span of support columns, and the boundary conditions at the edge of the plate. The concrete plate is assumed to be a homogeneous isotropic material. Results indicate that moment and deflection ratios decrease nonlinearly with increase of column stiffness and are dependent on the panel aspect ratio and the ratio of clear span to center-to-center span. Moment ratios, generally small for support moments, are smaller for exterior spans than for interior spans. Empirical formulas are presented to predict the moment ratios for both interior and exterior spans. (USBR)
W72-08745

INNOVATIONS IN CONCRETE REPAIR,
Bureau of Reclamation, Denver, Colo.
R. C. Borden, and C. E. Selander.
Paper, American Society of Civil Engineers National Meeting on Water Resources Engineering, Atlanta, Ga. Jan 1972. 19 p, 4 plate.

Descriptors: *Repairing, *Epoxy resins, Spillways, Cavitation, Construction methods, Concrete technology, Protective coatings, Concrete structures, Hydraulic structures, Construction materials, Chemical grouting, Finishing, Curing, Damages, Bonding, Aeration, Tunnel linings, Mortars, Erosion.
Identifiers: *Concrete deterioration, *Epoxy concretes, Yellowtail Dam (Mont), Bonding agents, *Concrete linings, *Epoxy mortar.

During June and July 1967, cavitation erosion seriously damaged the concrete lining of the Yellowtail Dam spillway tunnel. To avoid future problems, an aeration slot was added and damaged areas were repaired. Methods and materials used to repair the damaged areas depended on repair depths: epoxy bonded epoxy mortar for depths less than 1-1/2 to 2 in., epoxy bonded concrete for depths from 2 to 6 in., and bonded concrete for depths over 6 in. Epoxy bonded epoxy mortar is difficult to apply. Before placing the epoxy mortar, the concrete surface must be dried and sandblasted. Water seepage through hairline cracks hampered the drying procedure until a chemical grout successfully reduced the flow. After heating the prepared concrete surface to between 60 and 70 deg F, the 2 components of the epoxy bond coat were mixed and applied. The epoxy mortar was a mixture of epoxy resin and clean, dry, well-graded sand. During repairs, the epoxy mortar presented some problems in mix design, finishing, curing, placing, and painting. Postrepair tests showed this to be an acceptable, durable repair method. (USBR)
W72-08747

STRESS-STRAIN PROPERTIES OF RANDOM WIRE REINFORCED CONCRETE,
Lehigh Univ., Bethlehem, Pa.; and Bethlehem Steel Co., Pa.
W-F Chen, and J. L. Carson.
Journal of the American Concrete Institute, Proceedings, Vol 68, No 12, p 933-936, Dec 1971. 6 fig, 1 tab, 3 ref.

Descriptors: *Concrete testing, *Reinforced concrete, *Fibers, Concrete technology, Reinforcement, Stress-strain curves, Compressive strength, Tensile strength, Ductility, *Mortars, Testing procedures.
Identifiers: *Wire, *Test results, Concrete properties, Test equipment.

Tests measured the effects of length of randomly oriented wire fibers, percentage by volume of reinforcement, and curing age on the tensile strength, compressive strength, and ductility of mortar and concrete. Standard cylinders were tested in direct compression and indirect tension in a mechanism designed to obtain all the stress-strain curves for the 2 materials. Typical trends for tensile load-strain and compressive stress-strain curves are illustrated. The optimum fiber length for mortar specimens was 0.5 in. at 0.75% by volume for both tensile and compressive strength ratios. The 1-in.-long fiber-reinforced concrete specimens with 2% by volume reinforcement exhibited a much greater tensile strength than other length fibers. A 60% increase in the compressive strength of mortar using the optimum length fibers and volume reinforcement was observed. Neither length of fibers nor percentage of reinforcement had any effect on the compressive strength of concrete. Large increases in ductility were observed for both fiber-reinforced mortar and concrete. Age does not affect the tensile strength ratio of mortar or concrete, but does increase the compressive strength ratio of mortar and decreases the compressive strength ratio of concrete by about 10%. (USBR)
W72-08749

DEEP BEAM BEHAVIOR AFFECTED BY LENGTH AND SHEAR SPAN VARIATIONS,
Carleton Univ., Ottawa (Ontario); and Alberta Univ., Edmonton.
R. F. Manuel, B. W. Slight, and G. T. Suter.
Journal of the American Concrete Institute, Proceedings, Vol. 68, No. 12, p 954-958, Dec 1971. 6 fig, 2 tab, 12 ref, append.

Descriptors: *Reinforced concrete, *Structural analysis, *Failures, Shear, Structural engineering, Tests, Test results, Spans, Cracks, Deflection.
Identifiers: Ultimate strength, Canada, *Deep beams, Shear cracks, Shear forces, Bending moments, Spacing.

The results of investigations of 12 reinforced concrete deep beams are summarized. The variables a/d and L/d are systematically varied while other major variables are held constant. The parameter a is the length of the shear span, d the distance from the compression face of the beam to the centroid of the reinforcement and L the length of the beam between the reactions. The effects of changes in a/d and L/d on failure, diagonal cracking, steel strains at the support, maximum crack widths and midspan deflections are given. Deep beams with a/d equal to 0.30 failed in web compression. Beams with a/d from 0.65 to 1.00 failed in flexure. The parameter L/d has little influence on beam strength as indicated by the horizontal nature of the failure curves. Maximum flexural and diagonal crack widths apparently are not influenced by a/d, but are reduced slightly by increases in L/d for a constant a/d. The observed deflections are larger than the calculated deflections, reflecting the importance of diagonal cracking in increasing beam deflections. As the load increases, diagonal crack widths increase and the discrepancy between the observed and calculated deflections also increases. (USBR)
W72-08750

EXPANSION OF CONCRETE PUMPED THROUGH ALUMINUM PIPELINE,
Alberta Univ., Edmonton; and Materials Testing Labs., Ltd., Edmonton (Alberta).
E. L. Fowler, and E. F. Holmgren.
Journal of the American Concrete Institute, Proceedings, Vol. 68, No. 12, p 950-953, Dec 1971. 2 fig, 3 tab, 6 ref.

Descriptors: *Concrete construction, *Concrete placing, *Concrete technology, Construction equipment, Building materials, Set-retarding agents, Compressive strength, Steel pipes, Concretes, Aluminum, Construction materials, Concrete pavements, Expansion, Pipes.
Identifiers: *Expansive concretes, *Pumped concrete, Concrete slabs, Water-reducing agents, Bridge decks.

Pumping concrete through aluminum pipelines caused maximum compressive strength losses of from 40 to 50%. The strength losses were caused by a reaction between the portland cement paste and aluminum powder abraded from the pipeline, forming a hydrogen gas and expanding the concrete. During construction of a bridge deck in Canada, concrete expansion and 25 to 30% compressive strength losses were observed in some control cylinders. The expanding concrete had been pumped through aluminum lines. Strength tests on cores from the corresponding area of the

bridge deck averaged 2865 psi–substantially less than the desired 4000 psi strength. Concrete in this area of the deck was removed and replaced. Tests were then performed to compare strengths of concrete pumped through aluminum and steel pipelines. Conclusions were: (1) pumping concrete through an aluminum line can result in expansion and significant strength loss, (2) keeping concrete in an aluminum line for an extended period of time does not increase expansion, (3) sodium- and calcium-based water-reducing and set-retarding agents cause no significant difference in expansive characteristics, and (4) exposure to direct sunlight may cause increased expansion. (USBR)
W72-08753

TEMPERATURE RISES IN LOW-HEAT CEMENT CONCRETE,
Birmingham Univ. (England).
B. P. Hughes.
Journal of the Structure Division, American Society of Civil Engineers, Vol. 97, No. ST12, p 2807-2823, Dec 1971. 9 fig, 7 tab, 4 ref, append.

Descriptors: *Cements, *Mass concrete, Concretes, Concrete dams, Concrete technology, Thermal properties, Foundations, Concrete additives, Concrete placing, Test results, Strength, Heat balance, On-site tests, Heat transfer, Reinforced concrete.
Identifiers: *Cement hydration, *Heat of hydration, *Temperature rise, Crack control, Low heat cements.

A frequent cause for concern in concrete structures today is cracking caused by a temperature drop following liberation of the heat of hydration. Cements with low heat of hydration characteristics are preferred for massive members. Modern cements have much higher strengths, are more finely ground, and harden more rapidly than earlier cements. Recent field tests showed that the criteria specified in either ASTM standard C 150-66 or BS 1370:1958 are irrelevant. The temperatures obtained in a thick raft of high-strength concrete placed in the office block of the ATV Paradise Center, Birmingham, support this conclusion. The predicted and recorded temperature rises for concrete with different cements are given. The most rapid temperature rise occurred in the first 24 hr after placement of a conventional low-heat portland cement. The maximum temperature rise predicted was 26 deg C; the recorded rise was 47 deg C. (USBR)
W72-08755

8G. Materials

CORROSION, WATER COMPOSITION AND WATER TREATMENT,
British Non-Ferrous Metals Research Association, London (England).
For primary bibliographic entry see Field 05F.
W72-08624

DEZINCIFICATION OF BRASS,
San Diego Dept. of Utilities, Calif.
D. A. Hoffman, and F. O. Waters.
Water and Sewage Works, Vol 114, Ref. Ed., p R-10-14, November 1967. 2 tab, 7 ref.

Descriptors: Water supply, *Corrosion, *Zinc, *Temperature, *Dissolved oxygen, *Arsenic, Lead, Iron, Manganese, California, *Distribution systems.
Identifiers: *Tin, Bismuth, *Brass, *San Diego (Cal), *Dezincification.

Dezincification is the term applied to the selective corrosion of zinc from copper zinc alloys. It is most frequently found in brasses containing less than 85 percent copper. Dezincification of brasses is accelerated by low oxygen supply, high temperatures, contact with a more cathodic metal and the presence of chlorides. Arsenic as an alloying metal is a powerful inhibitor of dezincification in alpha brass, but is less effective in two-phase alloys. Tin tends to inhibit dezincification, but not to the extent of arsenic. The effect of lead is uncertain. Iron, manganese and bismuth increase the tendency of brass to dezincify. Experience of the San Diego Utilities Department is described. (Bean-AWWARF)
W72-08795

PRESTRESSING WATER FOR CORROSION CONTROL,
Long Beach Dept. of Water, Calif.
For primary bibliographic entry see Field 05F.
W72-08864

CALCITE COATING PROTECTS WATER PIPES,
Michigan State Univ., East Lansing. Dept. of Civil Engineering.
R. F. McCauley.
Water and Sewage Works, Vol 107, No 7, p 276-281, July 1960. 6 fig, 11 ref.

Descriptors: Water treatment, *Stabilization, *Corrosion, *Calcite, Phosphates, Hydrogen ion concentration, *Distribution systems, *Corrosion control, *Protective coatings, Coatings.
Identifiers: *Momentary excess, *Driving force index.

Theories explaining the causes of distribution system corrosion, and the means of controlling corrosion have been advanced, yet water quality continues to deteriorate in distribution systems. A means of insulating pipe from attack through careful control of calcium carbonate deposition by use of polyphosphates is described. Further field testing is essential with a number of different waters to define the optimum levels of polyphosphate, Driving Force Index (DFI) and Momentary Excess (ME) which should be maintained during the few hours of primary deposition. More information is also needed on the continuing ME and DFI which should be carried in distribution systems to retain and improve the coatings. (Bean-AWWARF)
W72-08868

SEALING OF UNDERWATER FISSURES,
For primary bibliographic entry see Field 05G.
W72-09017

8I. Fisheries Engineering

GREGARIOUS SETTING IN THE AMERICAN OYSTER CRASSOSTREA VIRGINICA GMELIN: I. PROPERTIES OF A PARTIALLY PURIFIED 'SETTING FACTOR',
Maryland Univ., College Park. Dept. of Chemistry; and Maryland Dept. of Research and Education, Solomons. Chesapeake Biological Lab.
F. P. Veitch, and H. Hidu.
Chesapeake Science, Vol 12, No 3, p 173-178, 1971. 2 tab, 12 ref. OWRR B-009-MD (1).

Descriptors: *Larvae, *Oysters, *Reproduction, Methodology, Enzymes, Amino acids, Chromatography, Bioassay, Proteins.
Identifiers: *Crassostrea virginica, *Setting factor, Thyroxine, Tyrosine, Thyroprotein, Oyster shell liquor.

Study of the 'setting factor' in oyster shell liquor involved procurement of the liquor, dialysis, ultrafiltration, acetone precipitation of the active fraction, ammonium sulfate precipitation, enzymatic and alkaline digestion of 100 KR66 fraction and extraction of iodinated amino acids, thin layer chromatography, and biological assay. The set stimulating factor from oyster shell liquor is nondialyzable precipitated by 50% acetone and salted out of solution by 66% saturation with ammonium sulfate. The setting factor seems to be a thyroprotein. That thyroxine is a part of this protein molecule is evident by the fact that the thyroxine is liberated from the protein molecule by digestion with proteolytic enzymes. In addition, while thyroxine alone at concentrations of 1 mg/750 ml stimulated set 1.48 times control values, the protein, containing thyroxine, caused an increase in set over control of 1.22 times at a protein concentration of 50 micrograms/750 ml. This points to a more than casual relation between the protein and thyroxine. The stimulation of set in other species by iodinated casein, a substance exhibiting thyroprotein-like activity is further evidence that a thyroprotein is the set stimulating factor. (Jones-Wisconsin)
W72-08580

VULNERABILITY OF SOME FISHES TO NORTHERN PIKE (ESOX LUCIUS) PREDATION,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
W. L. Mauck, and D. W. Coble.
Journal of the Fisheries Research Board of Canada Vol 28, No 7, p 957-969. 1971. Illus.
Identifiers: Catostomus, Carp, *Dorosoma, Esox lucius, *Fish, Ictiobus, Lepomis, Micropterus, Notemigonus, Perca, *Pikes, Pimephales, *Predation, Vulnerability.

To compare vulnerability to predation by E. lucius Linnaeus, several species of fish in various combinations were held with pike in plastic swimming pools with and without cover and in small ponds. The most vulnerable species in order were gizzard shad (Dorosoma cepedianum), carp (Cyprinus carpio), bigmouth buffalo (Ictiobus cyprinellus), fathead minnow (Pimephales promelas), and smallmouth bass (Micropterus dolomieui). White sucker (Catostomus commersoni), green sunfish (Lepomis cyanellus), largemouth bass (Micropterus salmoides), golden shiner (Notemigonus crysoleucas), and yellow perch (Perca flavescens) showed intermediate vulnerability. Channel catfish (Ictalurus punctatus), northern pike, bluegill (Lepomis macrochirus), and black bullhead (Ictalurus melas) were least vulnerable. In 2 experiments in which fish were put in cages in turbid water, relative vulnerability was the same as in clearer water. Pike could not be conditioned to eat golden shiner or bluegill. There was a tendency for certain sizes of pike to select the smaller carp, fathead minnow, and bluegill within the size ranges tested.–Copyright 1972, Biological Abstracts, Inc.
W72-08609

ROLE OF SOCIAL BEHAVIOR IN DISPERSAL OF INTRODUCED RAINBOW TROUT (SALMO GAIRDNERI),
Bureau of Sport Fisheries and Wildlife, Bishop, Calif. Sierra-Nevada Aquatic Research Lab.
T. M. Jenkins, Jr.
Journal of the Fisheries Research Board of Canada, Vol 28, No 7, p 1019-1027, 1971, Illus. Map.
Identifiers: *Fish behavior, Dispersal, Habitat, *Rainbow trout.

Hatchery-reared S. gairdneri planted under partially controlled conditions in an observation stream failed to sh ow social density regulation or socially induced dispersal. Aggression frequency was only an imprecise function of density, and density may not have been influenced by aggression at all. Dispersal following planting was extensive, but it apparently resulted from individual differences in response to the habitat. Group behavior (schooling) affected dispersal radically in some instances, when fish in large groups undertook movements they would not have undertaken alone or in small groups.–Copyright 1972, Biological Abstracts, Inc.
W72-08612

DISCRETENESS OF ATLANTIC HERRING (CLUPEA HARENGUS HARENGUS) POPULA-

TIONS IN SPRING AND AUTUMN FISHERIES IN THE SOUTHERN GULF OF ST. LAWRENCE,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
S. N. Messieh, and S. N. Tibbo.
Journal of the Fisheries Research Board of Canada, Vol 28, No 7, p 1009-1014, 1971, Illus. Map.
Identifiers: Autumn, Canada, Clupea harengus Harengus, Discreteness, Fisheries, Gulf, *Herrings, *Fish populations, Spring, *Gulf of St Lawrence.

Evidence was obtained that spring and autumn herring fisheries in the southern Gulf of St. Lawrence are supported by 2 discrete stocks. Samples from the 2 fisheries taken in 1965 through 1969 differed in length-and age-frequency distributions, year-class composition, growth rate, spawning time, and mean r .mbers of pectoral and dorsal fin rays.--Copyright 1972, Biological Abstracts, Inc.
W72-08613

(FLORIDA ATTORNEY GENERAL'S OPINION ON FISHING RIGHTS IN NAVIGABLE WATERS),
Florida State Dept. of Legal Affairs, Tallahassee.
For primary bibliographic entry see Field 06E.
W72-09051

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

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For primary bibliographic entry see Field 05A.
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SEDIMENT TRANSPORTATION MECHANICS: FUNDAMENTALS OF SEDIMENT TRANSPORTATION.
American Society of Civil Engineers, New York. Task Committee for Preparation of the Sedimentation Manual.
For primary bibliographic entry see Field 02J.
W72-08744

METHODS, MODELS AND INSTRUMENTS FOR STUDIES OF AQUATIC POLLUTION. AN ANNOTATED BIBLIOGRAPHY,
Ocean Engineering Information Service, La Jolla, Calif.
For primary bibliographic entry see Field 05A.
W72-08790

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Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W72-08883

LISTS OF REFERENCES AND SELECTED BOOKS BEARING ON WATER RESOURCES IN MINNESOTA,
Minnesota Univ., Minneapolis. Water Resources Research Center.
W. C. Walton.
Available from the National Technical Information Service as PB-209 866. Bulletin 4, Rev. March 1972, 75 p, 1,000 ref. OWRR A-999-MINN (23).

Descriptors: *Water resources development, *Minnesota, Pollution, Streams, Lakes, Planning, Research, Legal aspects, *Bibliographies, *Water Resources Institute, *Publication, Documentation.

The Minnesota Water Resources Research Center has had many requests for lists of references and books bearing on water resources in Minnesota. Published literature in this area is widely scattered and it has been difficult for research workers to become acquainted with available literature. This Bulletin, containing a list of references bearing on water resources in Minnesota and a list of selected books bearing on the physical, biological and social aspects of water resources in Minnesota, should be helpful to research workers and to people concerned with water resource development and management. About 1,000 references are provided on the following subjects: Climate, Fish and Wildlife, Forests and Waters, Geology and Groundwater, Lakes, Legal Aspects, Planning Aspects, Recreational Aspects, Research and Education, Soil and Water, Streamflow and Floods, Water Supply and Pollution, Water Resources, Water Resources Administration, Wetlands and Potholes, and Wild Rice.
W72-09086

LEGAL ASPECTS OF WATER POLLUTION IN NEW ENGLAND: A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05G.
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10D. Specialized Information Center Services

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American Water Works Association Research Foundation, New York.
For primary bibliographic entry see Field 05D.
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Louisiana Water Resources Research Institute	W72-08589	1
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation. Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

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